Use of Sony transmitter devices is regulated by the Federal Communications Commission as described in Part 74 subpart H of the FCC regulations and requires an appropriate license.

WRT-28H

US Model
Canadian Model

UHF TRANSMITTER

SPECIFICATIONS

Transmitter and modulator section

Carrier frequency	U.S.A. model: One frequency among the designated 14 between 947 MHz and 952 MHz Canadian model: One frequency among the designated 24 between 902 MHz and 928 MHz (according to the Sony channel plan)
Modulation	F3E (frequency modulation)
RF power output	30 mW (50 ohms load)
Oscillator	Crystal controlled, reactance modulation
Frequency stability	Within ±0.005%
Frequency multiplication	48
Pre-emphasis	50 μsec.
Reference deviation	±2.4 kHz (1 kHz, linear mode) ±9.4 kHz (1 kHz, compander mode)
Input attenuation range	Approx. 40 dB (continuously variable)
Frequency range	70 to 15,000 Hz
Audio distortion	Less than 0.3 % at ±2.4 kHz deviation, 1 kHz modulation (linear mode) Less than 0.7 % at ±9.4 kHz deviation, 1 kHz modulation (compander mode)
Signal-to-noise ratio	±2.4 kHz deviation at 1 kHz modulation (linear mode) More than 57 dB with A network ±9.4 kHz deviation at 1 kHz modulation (compander mode) More than 60 dB with A network
Type of antenna	Approx. λ/4 wavelength flexible wire

Power section

Supply voltage	3.0 V DC, two size AA (LR6) batteries
Standard operating voltage	3.0 V DC
Minimum operating voltage	1.8 V DC
Current flow	Less than 215 mA DC
Battery life	Approx. 4 hours of continuous use with two Sony batteries AM3 (LR6) at 25°C (77°F)

General

Operating temperature	0°C to +50°C (+32°F to +122°F)
Storage temperature	−20°C to +60°C (−4°F to +140°F)
Dimensions	Approx. 50 × 90 × 17 mm (w/h/d) ($2 \times 3^{5}/_{8} \times {}^{11}/_{16}$ inches)
Weight	Approx. 130g (4.6 oz) (including the batteries)

— continued on next page —

SONY®
SERVICE MANUAL

1st Edition (Revised 1)

Supplied microphone (equivalent to Sony ECM-77BC)

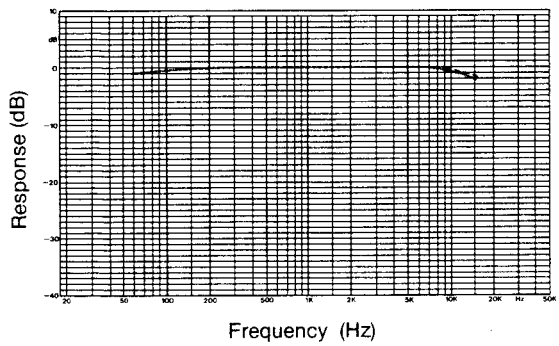
Type	Electret condenser
Directivity	Omni-directional
Power supply	Supplied from transmitter
Microphone cable	2.0 mm dia. two-cored shield × 1200 mm long ($^1/_{16}$ inches dia. × 47$^1/_4$ inches)
Dimensions	5.6 mm dia. × 12.5 mm length ($^1/_4$ inches × $^1/_2$ inches)
Weight	Approx. 1.5g (0.053 oz)

Supplied accessories

Microphone (1 set) (equivalent to Sony ECM-77BC, including the wind screen (1), and the holder clip (1))
Antenna (1)
Soft case (1)
Carrying case (1)
Microphone cable (1)
Battery case (1)

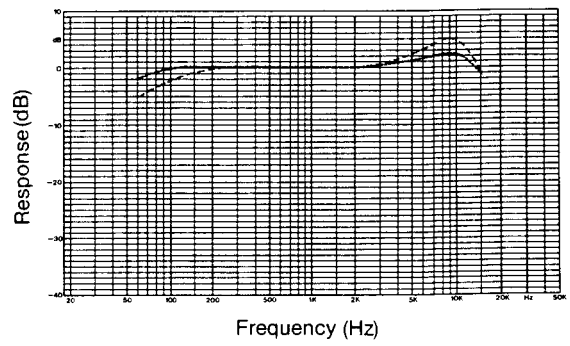
Design and specifications are subject to change without notice.

Frequency response (transmitter)



Deviation: ±2.4 kHz (at 1 kHz modulation, linear mode)
±9.4 kHz (at 1 kHz modulation, compander mode)
Input level: −60 dB (0 dB = 1Vrms)
De-emphasis: 50 μsec

Frequency response (with the supplied microphone)



Deviation: ±2.4 kHz (at 1 kHz modulation, linear mode)
±9.4 kHz (at 1 kHz modulation, compander mode)
Input level: 94 dB SPL
De-emphasis: 50 μsec

SECTION 1
OPERATION

1-1. INTRODUCTION

The WRT-28H is a highly reliable professional-quality UHF band FM transmitter.

Compact and lightweight

The unit is designed for use with the Sony WRR-28H UHF portable tuner.
With the supplied miniature microphone, the compact and lightweight transmitter allows the person holding the unit unlimited movement in ENG and EFP.

Applicable to both linear and compander systems

The unit can be used either in the conventional linear system or in the compander system (which uses a compressor when transmitting and an expander when receiving) by selecting the desired system using the mode selector in the unit. With the linear system, high quality sound can be obtained. With the compander system, radio noise is efficiently reduced and the service area of the wireless microphone system is expanded.

Simultaneous multiple-channel operation

Based on the experience and technology achieved in our wireless transmission systems, the Sony UHF wireless microphone system assures stable signal transmission. It achieves such high sensitivity and rejects external interference so efficiently that the system can be operated on multiple channels simultaneously.

Selectable transmitting frequency

The U.S.A. model comes in 14 versions and the Canadian model comes in 24 versions. Each of the versions has a transmitting frequency according to the Sony channel plan. (Refer to Tables 1 and 2.)
Although no frequencies are duplicated in Tables 1 and 2, operation of equipment from different groups in close proximity to each other may result in series of beat produced by the sound waves of different frequencies combining. Keep at least 100 meters between equipment from different groups, or shield them from each other.

Table 1: For U.S.A model

Group	Transmitting frequency (MHz)	Channel No. of transmitter	Matching tuner		Matching power amplifier
			WRR-27	WRR-28H	
1	947.25	11	Channel 11	Channel 11*	WP-27 (5) USA model (938 to 952 MHz)
	948.25	12	Channel 12		
	950.25	13	Channel 13	Channel 13*	
	951.75	14	Channel 14		
	949.00	15	Channel 15	Channel 15*	
2	947.75	21	Channel 21	Channel 21*	
	949.75	22	Channel 22		
	950.75	23	Channel 23	Channel 23*	
	951.25	24	Channel 24		
	948.50	25	Channel 25	Channel 15*	
3	949.25	31	Channel 31	Channel 31*	
	948.75	32	Channel 32		
	950.00	33	Channel 33	Channel 33*	
	951.50	34	Channel 34		

* WRR-28H tuners are capable of receiving on two channels, the channel indicated on the tuner and the next higher channel except for the WRR-28H channel 15 tuner, which receives on channel 25, not channel 16.

Table 2: For Canadian model

Group	Transmitting frequency (MHz)	Channel No. of transmitter	Matching tuner		Matching power amplifier
			WRR-27	WRR-28H	
1	902.75	11	Channel 11	Channel 11*	WP-27 (1) Canadian model (902 to 916 MHz)
	904.00	12	Channel 12		
	905.00	13	Channel 13	Channel 13*	
	908.25	14	Channel 14		
	909.00	15	Channel 15	Channel 15*	
	911.00	16	Channel 16		
	912.75	17	Channel 17	Channel 17*	
	915.75	18	Channel 18		
2	908.50	21	Channel 21	Channel 21*	WP-27 (2) Canadian model (908 to 922 MHz)
	909.75	22	Channel 22		
	910.75	23	Channel 23	Channel 23*	
	914.00	24	Channel 24		
	914.75	25	Channel 25	Channel 25*	
	916.75	26	Channel 26		
	918.50	27	Channel 27	Channel 27*	
	921.50	28	Channel 28		
3	914.25	31	Channel 31	Channel 31*	WP-27 (3) Canadian model (914 to 928 MHz)
	917.25	32	Channel 32		
	919.00	33	Channel 33	Channel 33*	
	921.00	34	Channel 34		
	921.75	35	Channel 35	Channel 35*	
	925.00	36	Channel 36		
	926.00	37	Channel 37	Channel 37*	
	927.25	38	Channel 38		

* WRR-28H tuners are capable of receiving on two channels, the channel indicated on the tuner and the next higher channel.

The channel number of your unit is indicated on the bottom. Be sure to use the UHF portable tuner whose channel number matches that of your unit.

1-2. PRECAUTIONS

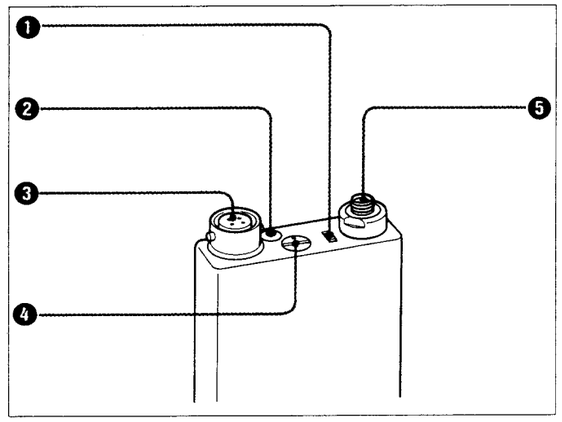
On operation

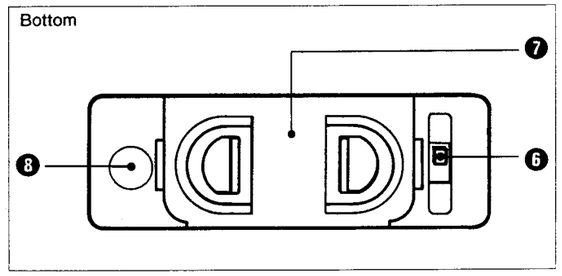
- The unit must be used within the temperature range of 0°C to 50°C (32°F to 122°F). Avoid using for an extended period of time in extremely high temperatures or in a place subject to direct sunlight because the finish of the case might be damaged. Never place the unit on or near heat sources, such as lighting equipment, power amplifiers, etc.
- The unit is designed for portable use and is built to resist humidity and dust. However, avoid using in very humid or dusty places, because such use may shorten the life of the unit.
- The switching of lights may produce electrical interference over the entire frequency range. Position the antenna and the wireless microphone in a place where such interference is at a minimum.

On cleaning

Clean the unit with a dry, soft cloth. Never use thinner or benzine, since these will damage the finish.

1-3. PARTS IDENTIFICATION



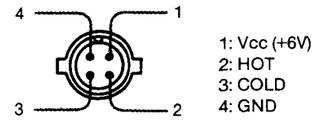


1 POWER switch

2 AF (audio input level)/battery indicator

3 Microphone connector
Connect the supplied microphone.

Pin assignment



1: Vcc (+6V)
2: HOT
3: COLD
4: GND

4 Input level attenuator
Set the attenuator to the position in which the AF/battery indicator starts to flicker with a normal input level signal. Counterclockwise rotation will decrease attenuation.

5 Antenna connector
Connect the supplied antenna.

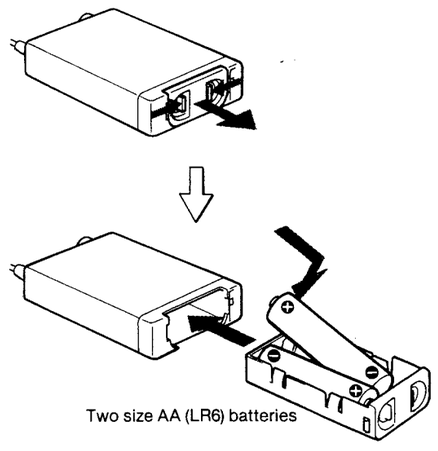
6 MODE selector
When the unit is used in the compander system, set this selector to CMPD. The audio signal passes through the compressor before transmission.
When the unit is used in the linear system, set the selector to LIN.

7 Battery case

8 Channel number

1-4. BATTERY INSERTION

Inserting batteries



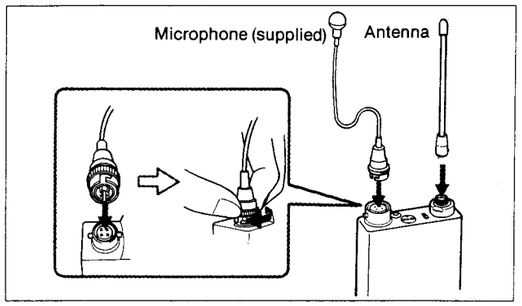
Two size AA (LR6) batteries

Checking the battery voltage
You can check the voltage of the batteries with the AF/battery indicator. The AF/battery indicator momentarily lights up when you turn on the unit if the battery voltage is 2.1 V or more. After that, this indicator shows the audio input level. When the battery voltage is less than 1.9 V, the indicator will not show the audio input level. In this case, change the batteries.

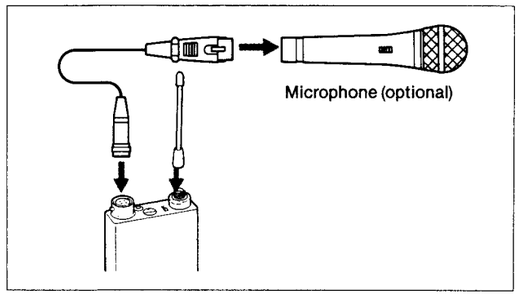
Note on batteries
When the unit will not be used for an extended period, be sure to remove the batteries in order to avoid battery discharge or leakage. If a battery does leak, wipe all leakage in the unit off and then insert new batteries. Leakage left in the unit may cause poor battery contact. If there seems to be poor battery contact, consult your Sony dealer.

1-5. CONNECTIONS

Using the supplied microphone



Using an optional microphone (equipped with a Cannon connector XLR-3-12C)



1-6. SYSTEM COMPOSITION

This wireless microphone system is well adapted to ENG and EFP use when used with the WRR-28H UHF portable tuner and a portable VTR-and-camera.

System composition and MODE selector setting

Unit / System	Transmitter/ Wireless microphone			Tuner		
	WRT-28H		WRT-27A	WRR-28H		WRR-27
	MODE selector		WRT-57	MODE selector		WRR-37
	LIN	CMPD	WRT-67	LIN	CMPD	WRR-57
Linear system	○	——	○	○	——	○
Compander system	——	○	——	——	○	——

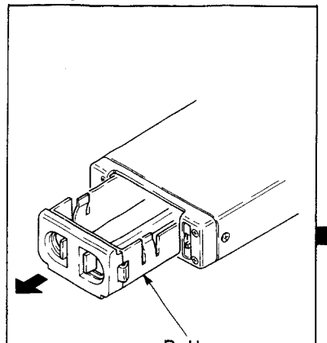
○: Combination is possible.

Construct your system using the transmitter/wireless microphone and tuner in the above combinations only.
With any combinations not listed in this table, the carrier can be received but the sound quality will not be good.

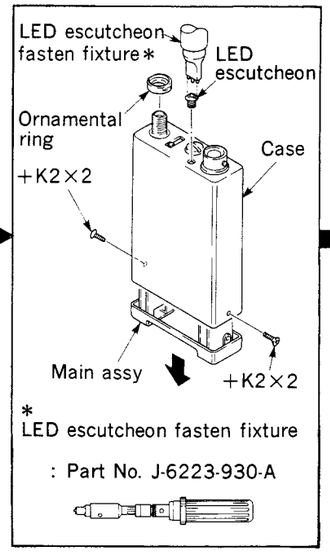
SECTION 2
SERVICE INFORMATION

2-1. DISASSEMBLY

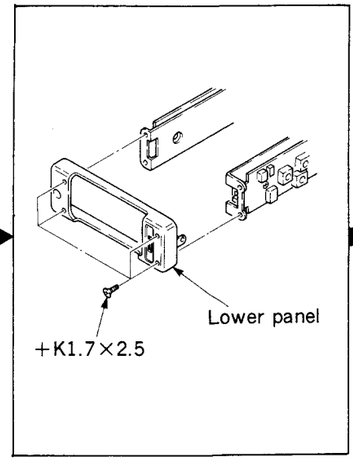
Battery Case Removal



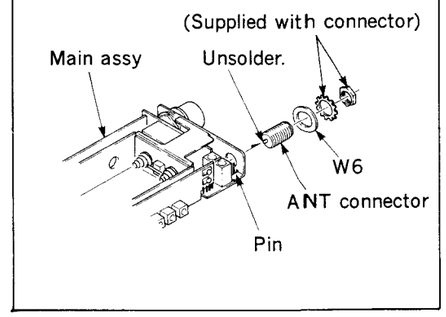
Case Removal



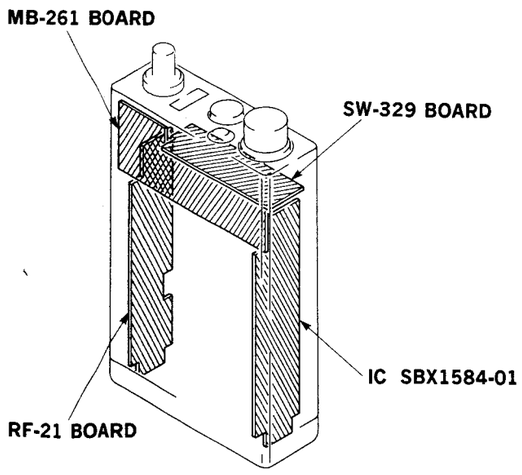
Lower Panel Removal



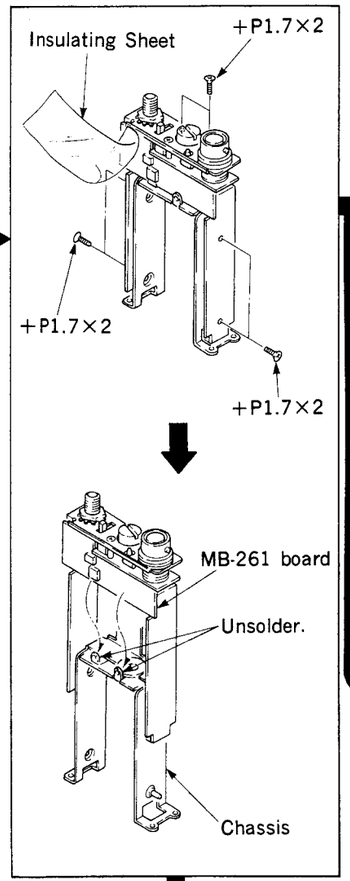
Antenna Connector Removal



2-2. CIRCUIT BOARDS LOCATION

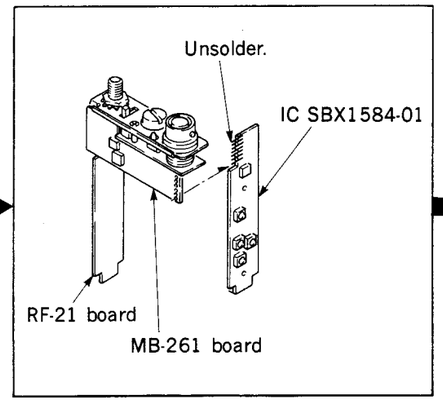


Chassis Removal

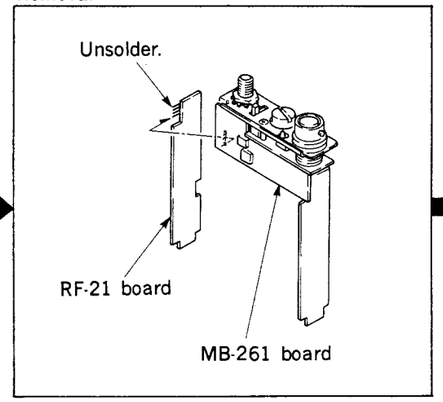


To Plus Terminal Board Removal

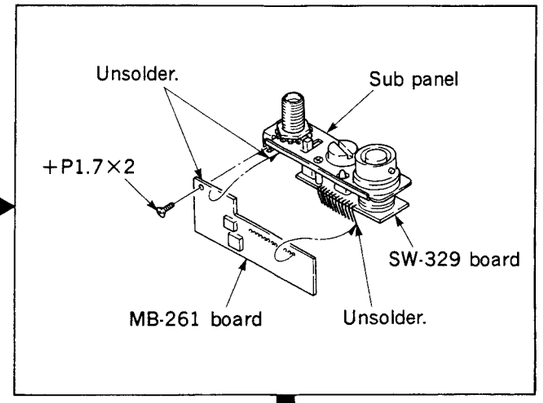
IC SBX1584-01 Removal



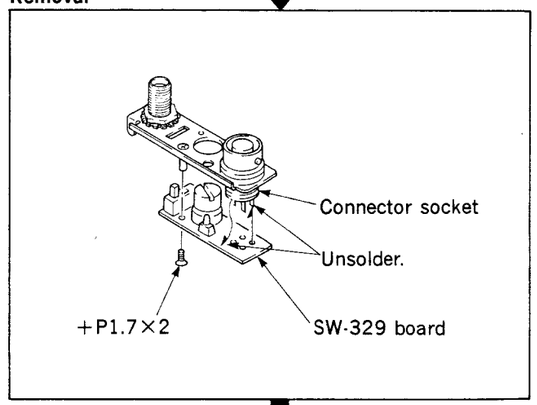
RF-21 Board Removal



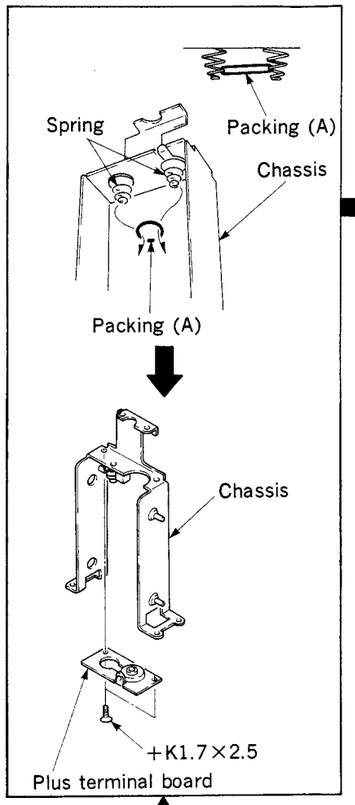
MB-261 Board Removal



SW-329 Board Removal

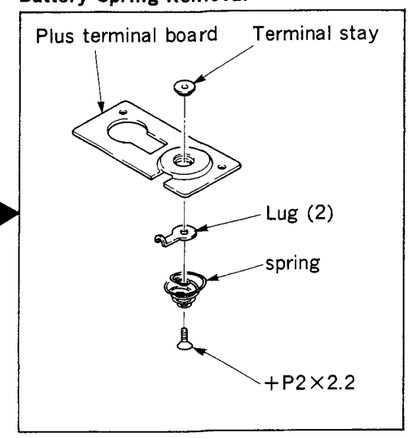


Plus Terminal Board Removal

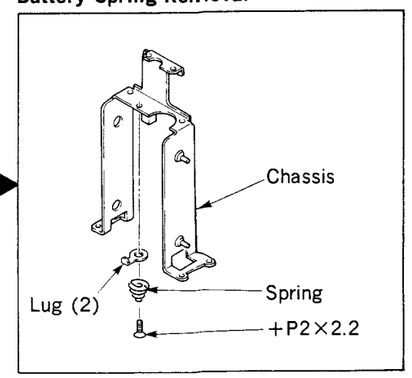


From Chassis Removal

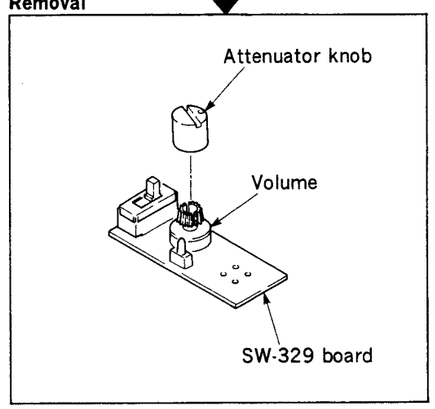
Battery Spring Removal



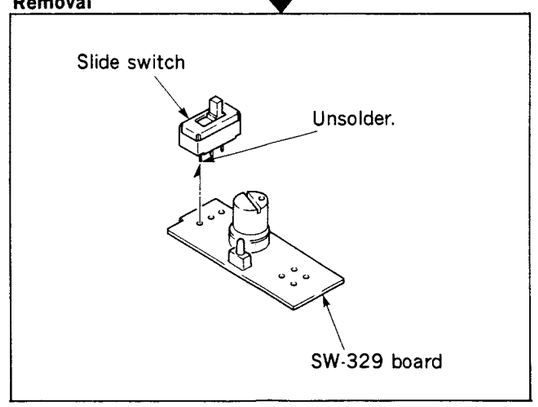
Battery Spring Removal



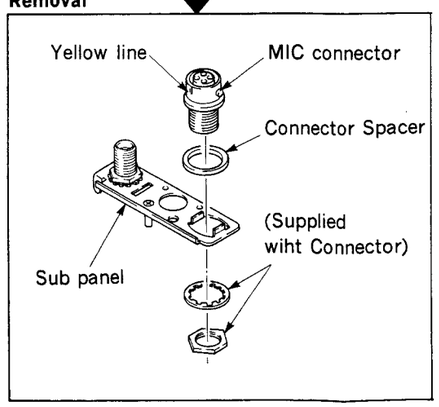
Attenuator Knob Removal



Slide Switch Removal



MIC Connector Removal



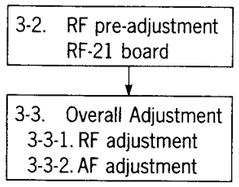
SECTION 3
ELECTRICAL ADJUSTMENT

3-1. OUTLINE

The electrical adjustments required for repair and maintenance of PC boards are described in this section.
Proceed with the adjustments in the order shown on the right, provided that all the previous adjustment items are normally functioning. When a trouble is likely attributable to plural items, adjust and confirm the previous and next items as well as the item in question.

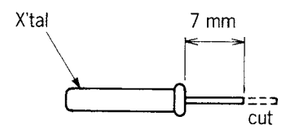
This section mainly describes the adjustments of internal switches and controls which are necessary to satisfy the specifications. Concerning the external switches, controls and operation, refer to the SECTION 1 OPERATION.

Procedure of Electrical Adjustments

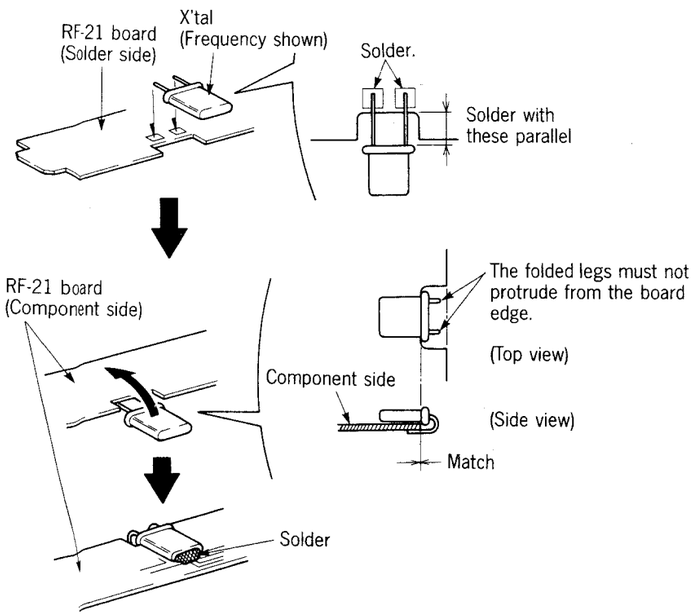


- **Precautions on the replacement of the RF-21 board**
  When replacing the RF-21 board and installing the X'tal, follow the steps below.

1. Installation of the X'tal
   (1) Cut the legs of the X'tal of the desired channel as shown below.



   (2) Install the X'tal as shown below.



2. After the installation of the X'tal, perform the following adjustment.
   3-2. RF PRE-ADJUSTMENT
   3-3. OVERALL ADJUSTMENT
   3-3-1. RF Adjustment
   3-3-2. AF Adjustment

Equipment Required

Description	Minimum Specification	Model Name
DC POWER SUPPLY	Range: 0 to 10 V	
DC CURRENT METER	Range: 0 to 500 mA Accuracy: class 1.0	
SPECTRUM ANALYZER	Frequency: 0.01 to 10 GHz	HP 8565A or equivalent
MODULATION ANALYZER	• RF Input Frequency: 150 kHz to 3000 kHz Operation level: −30 to +30 dBm Input impedance: 50Ω • FM Mode Residual FM: <2.5 Hz rms (10 to 1000 MHz carrier, 50 Hz to 3 kHz BW)	Anritsu MS-616A or MS-616B or equivalent
POWER METER WITH POWER SENSOR	Range: −20 to +10 dBm Accuracy: ±1.2%	HP 435A (with 8482A) or equivalent
AUDIO ANALYZER	• OSCILLATOR Frequency: 20 Hz to 100 kHz Output level: 0.6 μV to 6 V Impedance: 600Ω • DISTORTION Frequency: 20 Hz to 100 kHz Display range: 0.001% to 100% Accuracy: ±1 dB (20 Hz to 20 kHz)	HP 8903A or equivalent
AF DISTORTION ANALYZER	Frequency: 5 Hz to 600 kHz Display range: 0.1% to 100% Accuracy: ±1 dB (20 Hz to 20 kHz)	HP 334A or equivalent
AF OSCILLATOR	Frequency: 20 Hz to 100 kHz Accuracy: ±5%	
AF ATTENUATOR	Attenuation range: 0 to 60 dB Frequency: 20 Hz to 100 kHz Accuracy: 0.1 dB	
AF LEVEL METER	Frequency: 10 Hz to 500 kHz Range: −100 dB to +50 dB Residual noise: <1.5 μV (10 μV range)	
OSCILLOSCOPE	Frequency: DC to 10 MHz	
DC VOLT METER		

Tool and Fixture Required

Part No.	Name	For Use
J-6223-150-A	RF BOARD ADJUSTMENT FIXTURE	RF pre-adjsutment
J-6223-930-A	LED ESCUTCHEON FASTEN FIXTURE	For LED escutc heon Removal
7-721-052-88	SCREWDRIVER (ADJUSTER) (0.9 MM)	

(7) Set the modulation analyzer to FREQUENCY mode and adjust ◐ T102 of the RF-21 board so that the carrier frequency is in the specification mentioned below.

Specification: Carrier frequency ±5 kHz
Adjustment: ◐ T102, RF-21 board

(8) Input the signal below to the WRT-28H mic connector.
AUDIO ANALYZER or
AF OSCILLATOR, AF ATTENUATOR:
1 kHz, −60 dBV

(9) Set the modulation analyzer to FM mode and adjust the ◐ VR2 of SBX1584 so that the frequency deviation is in the specification mentioned below.

Specification:
Frequency deviation = ±2.4 kHz$^{\pm 0.1\ kHz}$/deviation
Adjustment: ◐ VR2, SBX1584

(10) Input 1 kHz, −26 dBV signal from the AF oscillator to the WRT-28H mic connector and check that the frequency deviation of the modulation analyzer is within ±120 kHz$^{\pm 10\ kHz}$/deviation.

(11) Input the signal below from the WRT-28H mic connector.
AUDIO ANALYZER or
AF OSCILLATOR, AF ATTENUATOR: 1kHz, −24dBV

(12) Adjust ◐ VR1 of SBX1584 so that the monitor waveform (sine wave) of the oscilloscope is not distorted.

2. CMPD (Compander) mode adjustment

(1) Set the MODE LIN/CMPD switch of the WRT-28H to CMPD mode position.

(2) Supply +3.00±0.01 V from the DC power supply to the WRT-28H battery spring terminal.

(3) Input the signal below to the WRT-28H mic connector.
AUDIO ANALYZER or
AF OSCILLATOR, AF ATTENUATOR:
1 kHz, −60 dBV

(4) Set the modulation analyzer to FM mode and adjust ◐ VR3 of SBX1584 so that the frequency deviation is in the specification mentioned below.

Specification:
Frequency deviation = ±9.4 kHz$^{\pm 0.2\ kHz}$/deviation
Adjustment: ◐ VR3, SBX1584

(5) Input the signal below to the WRT-28H mic connector.
AUDIO ANALYZER or
AF OSCILLATOR, AF ATTENUATOR:
1 kHz, −12 dBV

(6) Adjust ◐ VR4 of SBX1584 so that the frequency deviation of the modulation analyzer (FM mode) is in the specification mentioned below.

Specification:
Frequency deviation = ±72 kHz$^{\pm 2.5\ kHz}$/deviation
Adjustment: ◐ VR4, SBX1584

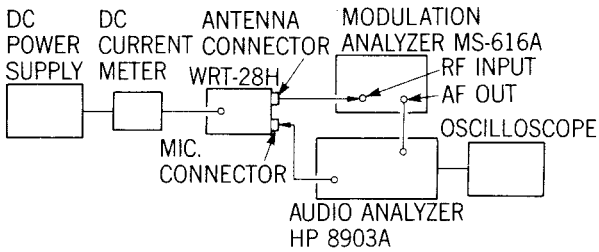
3-3-2. AF Adjustment (Adjustment of Hybrid IC SBX1584)

Equipment and Tool Required

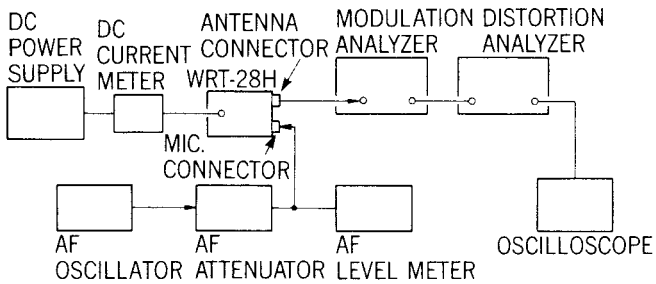
DC power supply
Modulation analyzer
Audio analyzer
AF oscillator
AF attenuator
AF level meter
Oscilloscope
Screwdriver (adjuster) (0.9 mm) (7-721-052-88)

Connections

1. When using AUDIO ANALYZER HP 8903A



2. When not using AUDIO ANALYZER



Note: The audio analyzer of connection (1) function as the AF oscillator, distortion analyzer and AF level meter. Unless the audio analyzer is always provided, adjust the connection of (2) above.

Equipment

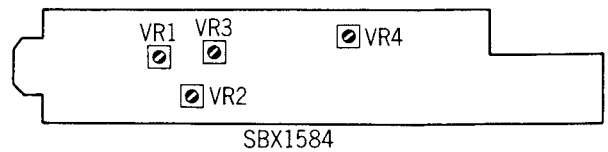
DC power supply:
DC range: +3.00±0.01 V

Modulation analyzer: Model Anritsu MS-616A
HPF: 50 Hz
LPF: 20 kHz
DE-EMPHASIS: 50 μs
CENTER FREQUENCY: Carrier frequency
Mode: FM or FREQUENCY

Switches and Controls Setting

POWER: ON
AF ATT: Max (clockwise)
MODE LIN/CMPD: LIN or CMPD

Adjustment Location



Adjustment Procedure

1. LIN (Linear) mode adjustment
   (1) Set the MODE LIN/CMPD switch of the WRT-28H to LIN mode position.
   (2) Turn ◐ VR1, VR3 and VR4 on the SBX1584 ccw fully.
   (3) Supply +3.00±0.01 V from the DC power supply to the WRT-28H battery spring terminal.
   (4) Input the signal below to the mic connector of the WRT-28H.
   AUDIO ANALYZER or
   AF OSCILLATOR, AF ATTENUATOR:
   1 kHz, −26 dBV (0 dBV=1 Vrms)
   (5) Set the modulation analyzer to FM mode and adjust ◐ VR2 of SBX1584 so that the frequency deviation is in the specification below.

   Specification:
   Frequency deviation = ±120 kHz$^{\pm 10\ kHz}$/deviation
   Adjustment: ◐ VR2, SBX1584

   (6) Adjust ◐ RV101 of the RF-21 board so as to minimize the distortion ratio of the distortion analyzer.

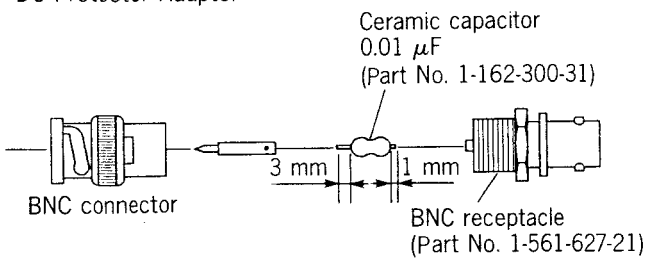
   Specification:
   Distortion ratio = 1.0 to 2.2% (Reference value)
   Adjustment: ◐ RV101, RF-21 board

3-3. OVERALL ADJUSTMENT

This adjustment must be performed with the individual boards installed on the unit.

Note: The direct current (approx. 5.7 V) is outputted from the ANTENNA connector of the WRT-28H.
When the equipment (spectrum analyzer, power meter or modulation analyzer) is connected to the ANTENNA connector, be sure to use a DC Protector Adaptor* between the ANTENNA connector and the equipment not to apply DC directly to the equipment.

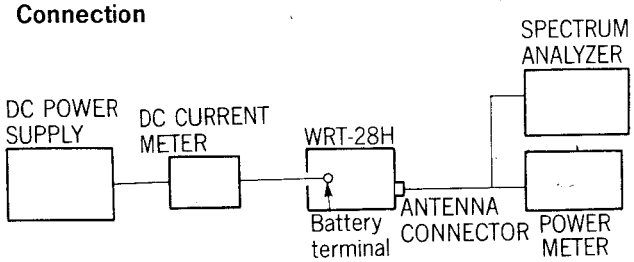
*DC Protector Adaptor



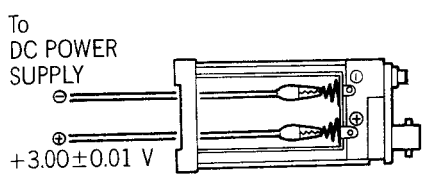
3-3-1. RF Adjustment

Equipment and Tool Required
DC power supply
DC current meter
Spectrum analyzer
Power meter
Screwdriver (adjuster) (0.9 mm) (7-721-052-88)

Connection



Connection to the battery terminal



Equipment
DC power supply
DC range: +3.00±0.01 V

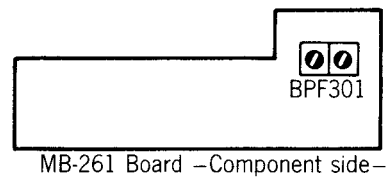
DC current meter
Range: 300 mA

Power meter
Range: 100 mW

Spectrum analyzer
CENTER FREQUENCY: 48xfo (carrier frequency)
REFERENCE LEVEL: 20 dBm
AMPLITUDE SCALE: 10 dB/DIV
FREQUENCY SPAN: 200 MHz/DIV

Switches and Controls Setting
POWER: ON
AF ATT: Max (clockwise)
MODE LIN/CMPD: LIN

Adjustment Location



Adjustment Procedure

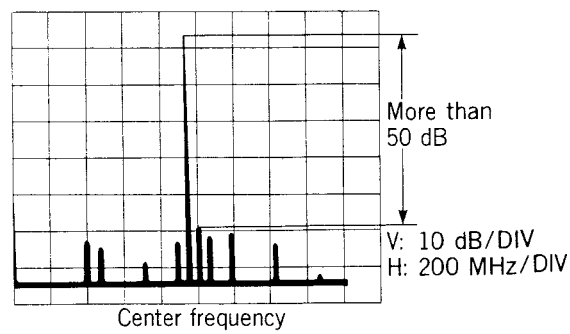
1. Supply +3.00±0.01V from the DC power supply to the WRT-28H battery spring terminal.

2. Adjust ◐ BPF301 (two trimmers) of the MB-261 board and ◐ CT104 of the RF-21 board so that the center frequency level of the spectrum analyzer and output level of the power meter are in the specification mentioned below.

   Specification: Spectrum analyzer = +15.0±0.25 dBm
   Power meter = 32±2 mW
   Adjustment: ◐ BPF301, MB-261 Board
   ◐ CT104, RF-21 Board

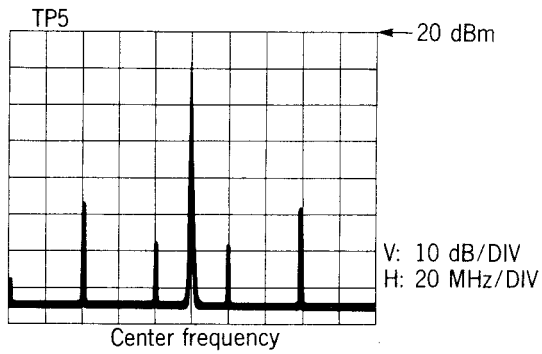
3. Adjust ◐ CT101 of the RF-21 board so that the spurious level is in the specification against the center frequency level of the spectrum analyzer.

   Specification:
   Spurious level is 50dB or more against +15.0±0.25 dBm.
   Adjustment: ◐ CT101, RF-21 Board



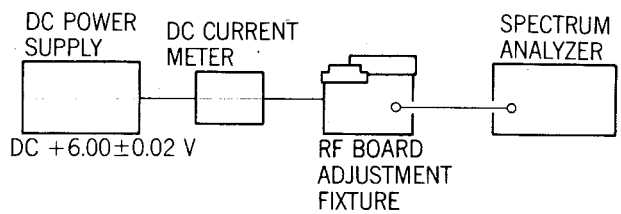
6. 48xfo frequency level adjustment
   (1) Connect the spectrum analyzer cord to TP105.
   (2) Set the spectrum analyzer as follows.
   CENTER FREQUENCY: 48 (3×2×2×2×2)xfo
   REFERENCE LEVEL: 20 dBm
   AMPLITUDE SCALE: 10 dB/DIV
   FREQUENCY SPAN: 20 MHz/DIV
   (3) Turn ON the DC power supply.
   (4) Adjust ◐ CT103 and CT102 so that the center frequency level of the spectrum analyzer is maximum in the specification mentioned below.
   Adjust CT103 and then adjust CT102 in order.

   Specification:
   Center frequency level = +12.5±1 dB
   Adjustment: ◐ CT103 and CT102



7. Remove the spectrum analyzer cord from TP105.

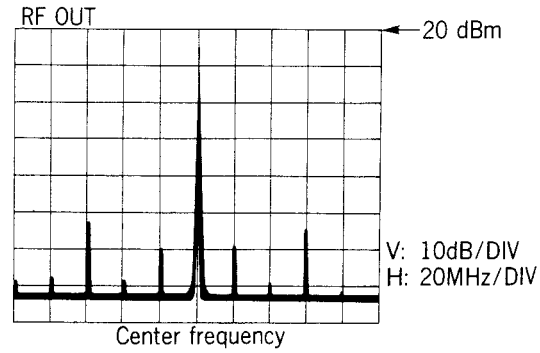
8. Connect BNC OUT of the RF board adjustment fixture and the INPUT connector of the spectrum analyzer with the BNC cord.



9. Supply +6.00±0.02V from the DC power supply.

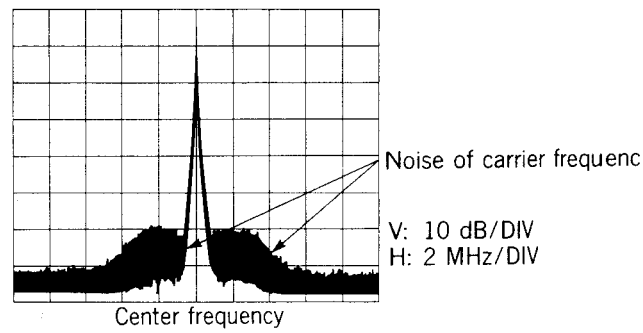
10. Adjust ◐ CT104 and CT103 so that the center frequency level of the spectrum analyzer is maximum in the specification mentioned below.
    Adjust CT104 and CT103 in order.

    Specification: Center frequency level = +16±0.5 dBm
    Adjustment: ◐ CT104 and CT103

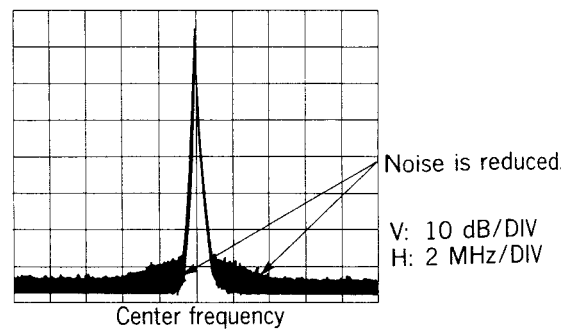


11. Change the setting of the FREQUENCY SPAN of the spectrum analyzer as shown below.
    FREQUENCY SPAN: 2 MHz/DIV

12. Adjust ◐ T103, T104, T105 and T106 so as to minimize the noise of the carrier frequency when the center frequency level of the spectrum analyzer is in the specification mentioned in step 10.

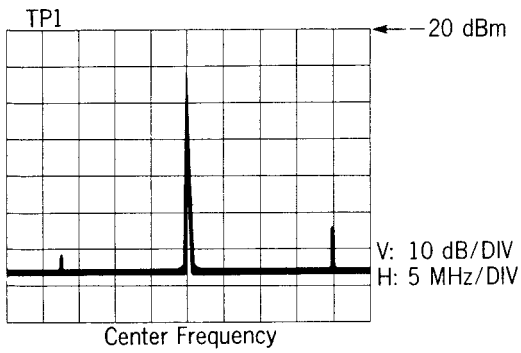


Adjustment: ◐ T103, T104, T105 and T106



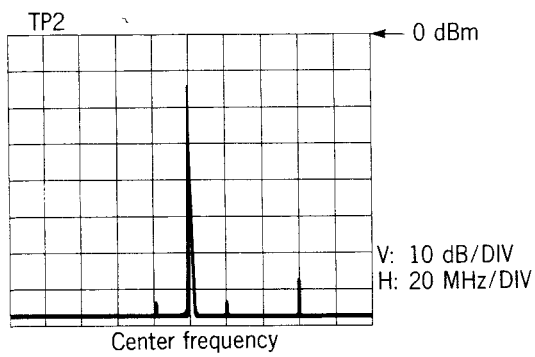
(4) Adjust ◐ T103 and T104 alternately so that the center frequency level of the spectrum analyzer is maximum in the specification mentioned below.

Specification:
Center frequency level = −30 to −35dB
Adjustment: ◐ T103 and T104



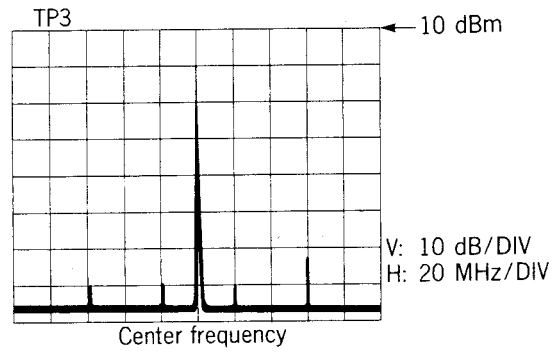
3. 6xfo frequency level adjustment
(1) Connect the spectrum analyzer cord to TP102.
(2) Set the spectrum analyzer as follows.
CENTER FREQUENCY: 6 (3×2)xfo
REFERENCE LEVEL: 0 dBm
AMPLITUDE SCALE: 10 dB/DIV
FREQUENCY SPAN: 20 MHz/DIV
(3) Turn ON the DC power supply.
(4) Adjust ◐ T105, T106 and T104 so that the center frequency level of the spectrum analyzer is maximum in the specification mentioned below.
Adjust T105 and T106 alternately and after adjustment of T105 and T106, adjust T104.

Specification:
Center frequency level = −10 to −20dB
Adjustment: ◐ T105, T106 and T104



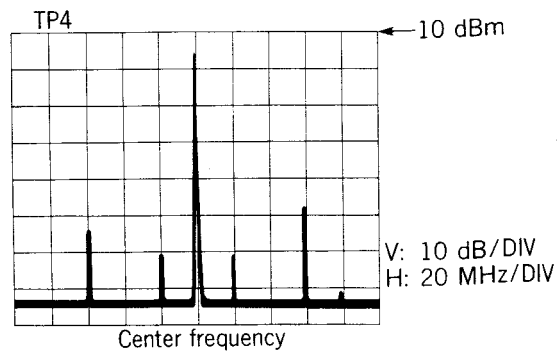
4. 12xfo frequency level adjustment
(1) Connect the spectrum analyzer cord to TP103.
(2) Set the spectrum analyzer as follows.
CENTER FREQUENCY: 12 (3×2×2)xfo
REFERENCE LEVEL: 10 dBm
AMPLITUDE SCALE: 10 dB/DIV
FREQUENCY SPAN: 20 MHz/DIV
(3) Turn ON the DC power supply.
(4) Adjust ◐ CT101 and T104 so that the center frequency level of the spectrum analyzer is maximum in the specification mentioned below.
Adjust CT101 and then adjust T104 in order.

Specification:
Center frequency level = −2 to +2 dB
Adjustment: ◐ CT101 and T104



5. 24xfo frequency level adjustment
(1) Connect the spectrum analyzer cord to TP104.
(2) Set the spectrum analyzer as follows.
CENTER FREQUENCY: 24 (3×2×2×2)xfo
REFERENCE LEVEL: 10 dBm
AMPLITUDE SCALE: 10 dB/DIV
FREQUENCY SPAN: 20 MHz/DIV
(3) Turn ON the DC power supply.
(4) Adjust ◐ CT102 and CT101 so that the center frequency level of the spectrum analyzer is maximum in the specification mentioned below.
Adjust CT102 and then adjust CT101 in order.

Specification:
Center frequency level = +5 to +10 dB
Adjustment: ◐ CT102 and CT101



3-2. RF PRE-ADJUSTMENT (RF-21 BOARD)

This adjustment must be performed when the RF-21 board is replaced.

Equipment and Tools Required

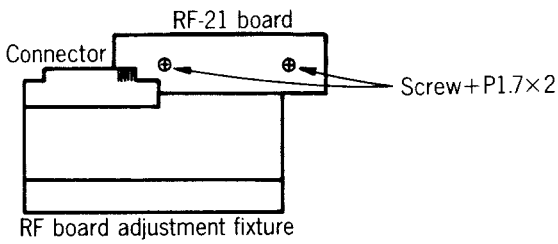
DC power supply
Spectrum analyzer
RF board adjustment fixture (J-6223-150-A)
1pF cap, ceramic (1-161-051-00)
Screw, +P1.7×2 (7-627-552-27)
Screwdriver (adjuster) (0.9 mm) (7-721-052-88)

Preparation

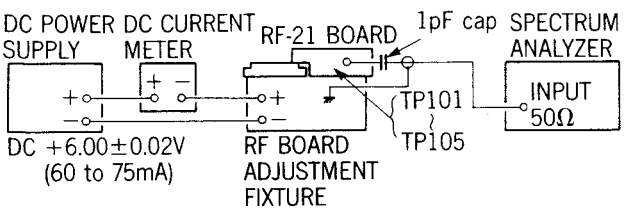
Install the RF-21 board onto the RF board adjustment fixture.

How to Install:

(1) Insert the pins of the RF-21 board into the connector of the fixture.
(2) Fix the RF-21 board on the fixture with two screws.



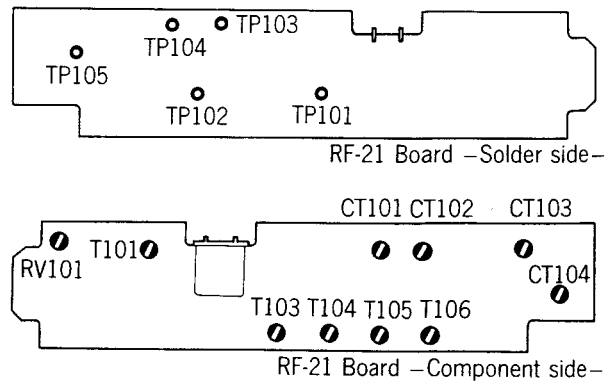
Connection



Equipment

DC power supply
DC range: +6.00±0.02 V

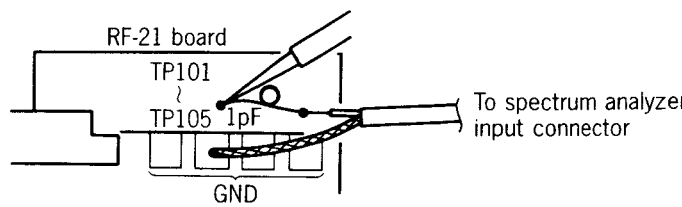
Adjustment Location



Adjustment Procedure

Note:

1) Couple the spectrum analyzer cord with the 1pF capacitor and connect it to TP101 through TP105 (by soldering).



RF board adjustment fixture

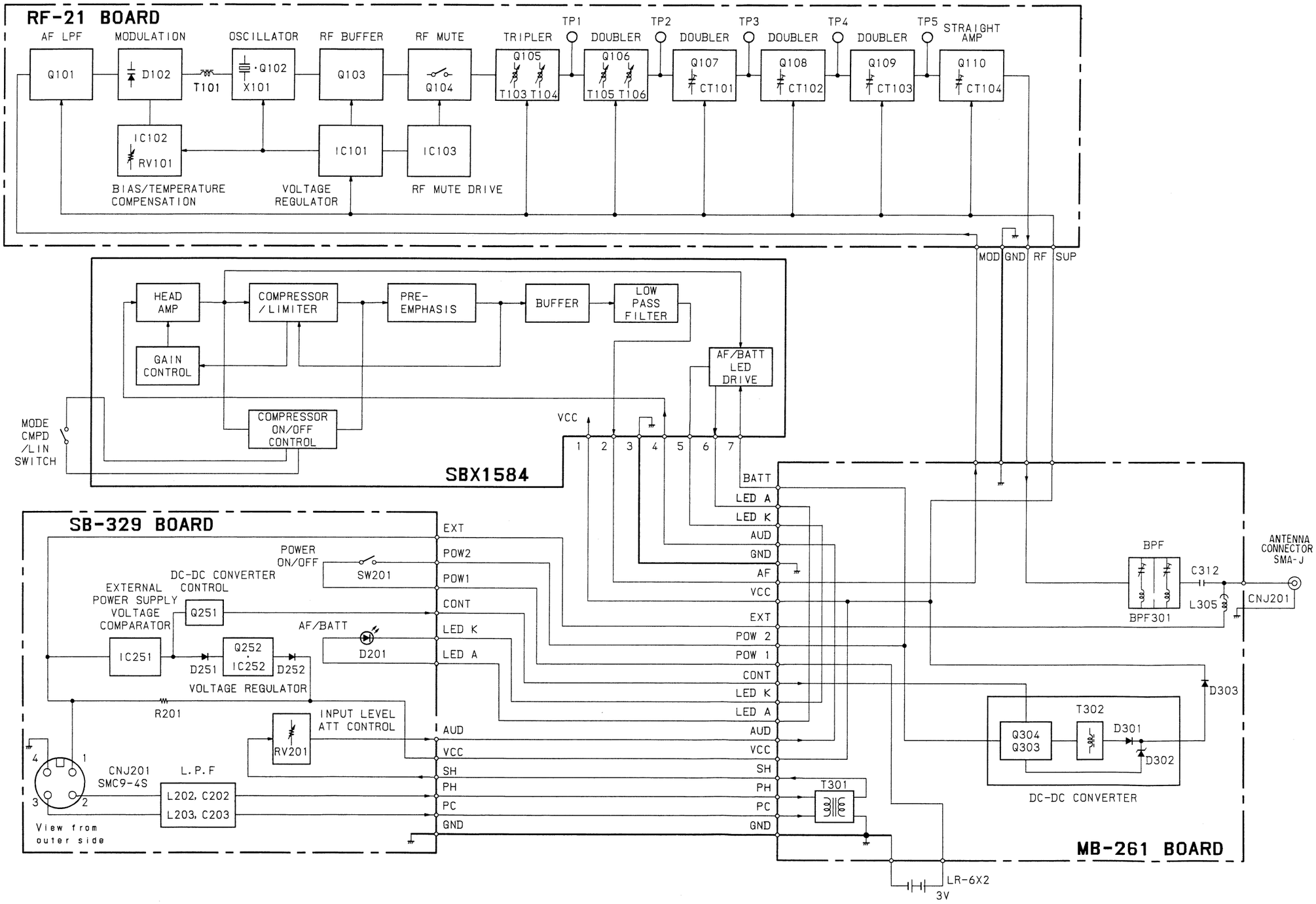
2) When changing the connection (soldering) of the measuring positions (TP101 to TP105), keep the DC power supply OFF.

1. Turn the coil (T101) of the RF-21 board ccw.

2. 3xfo frequency level adjustment (fo = Fundamental frequency of X'tal)
   (1) Connect the spectrum analyzer cord to TP101.
   (2) Set the spectrum analyzer as follows.
   CENTER FREQUENCY: 3xfo
   REFERENCE LEVEL: −20 dBm
   AMPLITUDE SCALE: 10 dB/DIV
   FREQUENCY SPAN: 5 MHz/DIV
   (3) Turn ON the DC power supply.

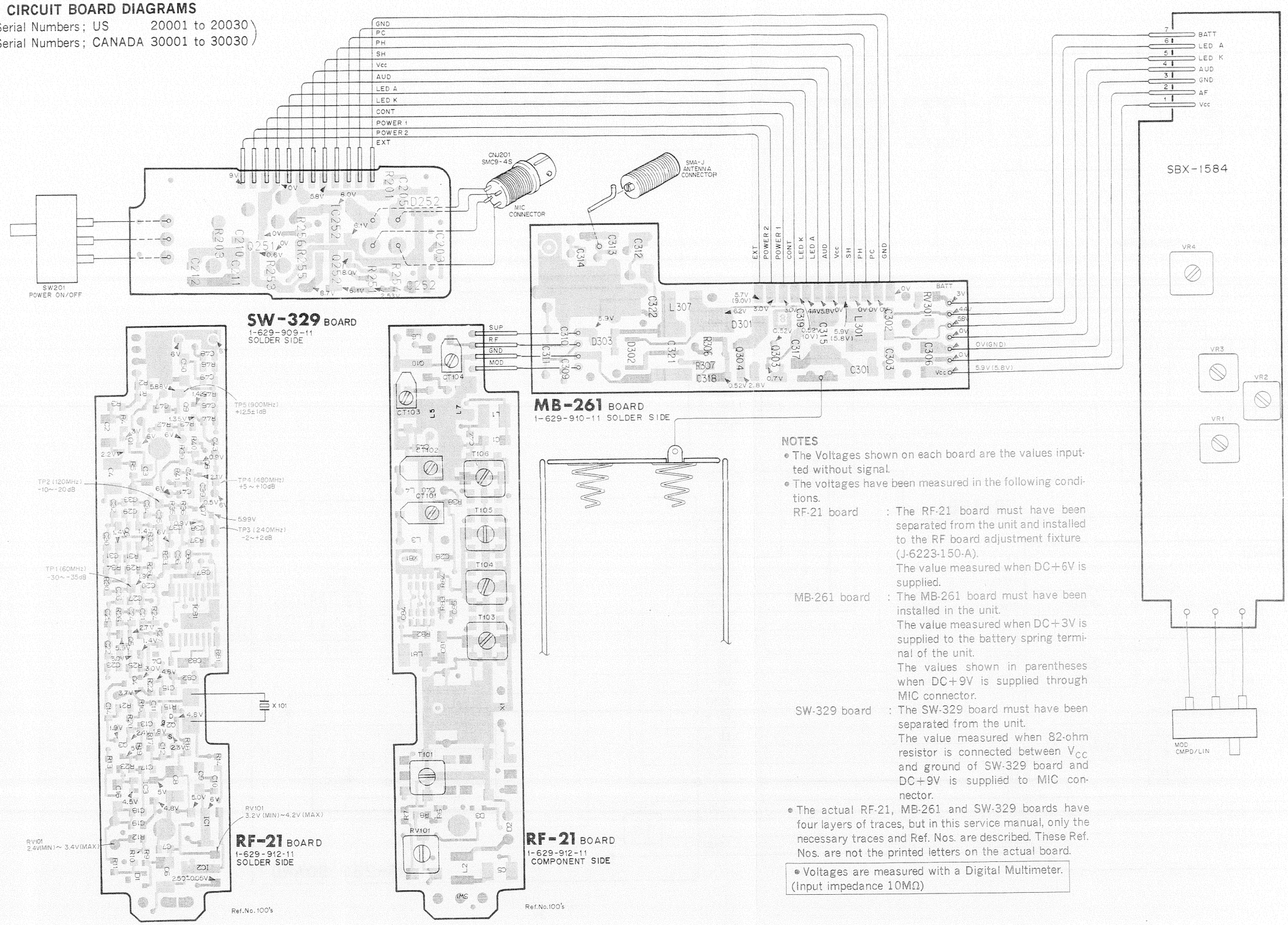
SECTION 4
BLOCK, SCHEMATIC AND CIRCUIT BOARD DIAGRAMS

4-1. BLOCK DIAGRAM



4-2. CIRCUIT BOARD DIAGRAMS

(Serial Numbers; US 20001 to 20030
Serial Numbers; CANADA 30001 to 30030)



NOTES

- The Voltages shown on each board are the values inputted without signal.
- The voltages have been measured in the following conditions.

RF-21 board : The RF-21 board must have been separated from the unit and installed to the RF board adjustment fixture (J-6223-150-A).
The value measured when DC+6V is supplied.

MB-261 board : The MB-261 board must have been installed in the unit.
The value measured when DC+3V is supplied to the battery spring terminal of the unit.
The values shown in parentheses when DC+9V is supplied through MIC connector.

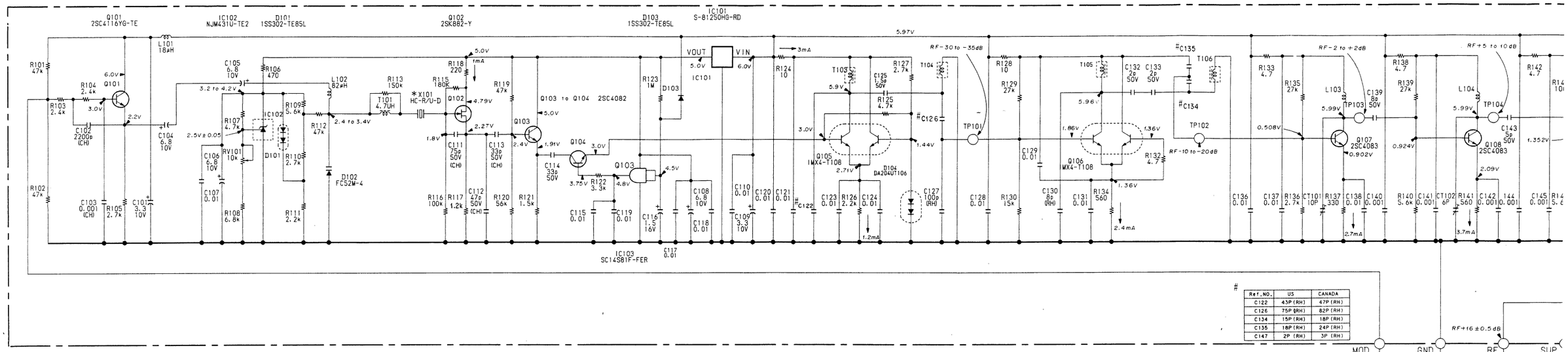
SW-329 board : The SW-329 board must have been separated from the unit.
The value measured when 82-ohm resistor is connected between V_{CC} and ground of SW-329 board and DC+9V is supplied to MIC connector.

- The actual RF-21, MB-261 and SW-329 boards have four layers of traces, but in this service manual, only the necessary traces and Ref. Nos. are described. These Ref. Nos. are not the printed letters on the actual board.

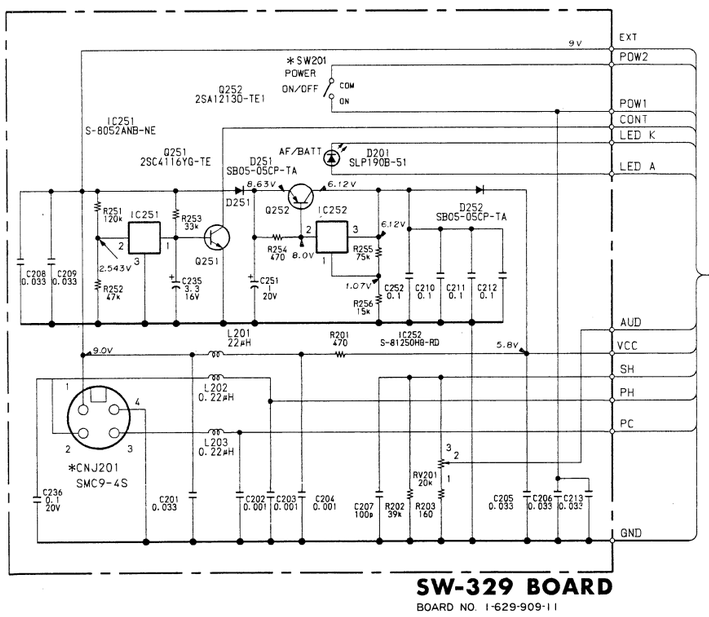
• Voltages are measured with a Digital Multimeter. (Input impedance 10MΩ)

4-3. SCHEMATIC DIAGRAMS

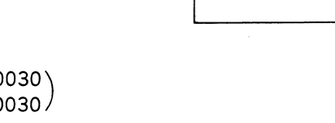
(Serial Numbers; US 20001 to 20030
Serial Numbers; CANADA 30001 to 30030)

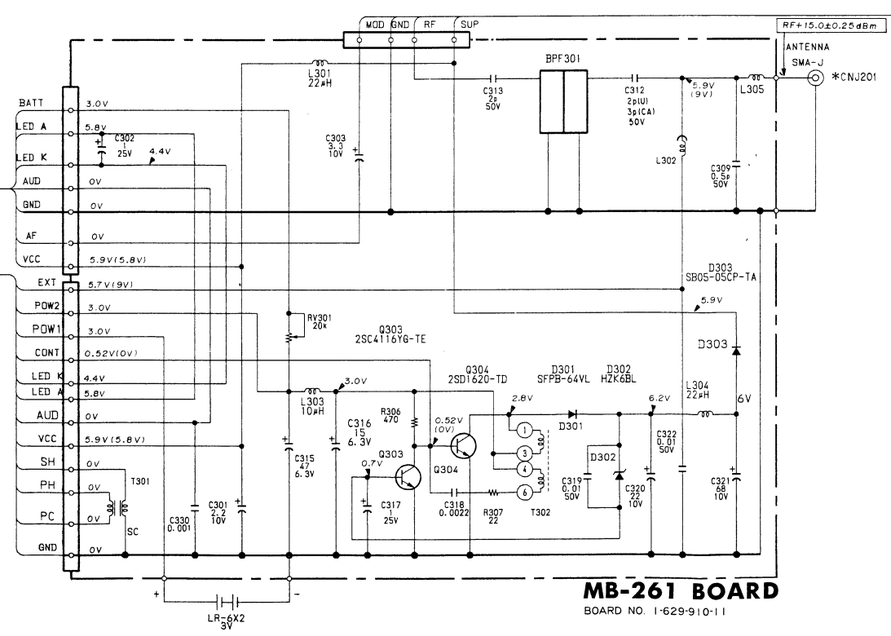


#	Ref.NO.	US	CANADA
	C122	43P (RH)	47P (RH)
	C126	75P (RH)	82P (RH)
	C134	15P (RH)	18P (RH)
	C135	18P (RH)	24P (RH)
	C147	2P (RH)	3P (RH)



SW-329 BOARD
BOARD NO. 1-629-909-11





MB-261 BOARD
BOARD NO. 1-629-910-11

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MB-26

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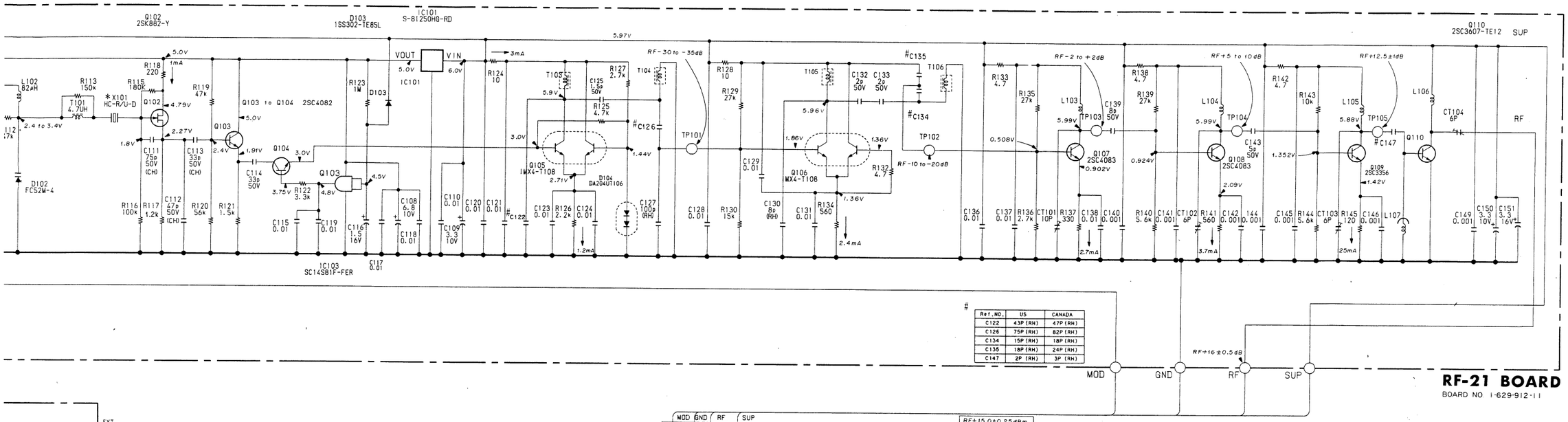
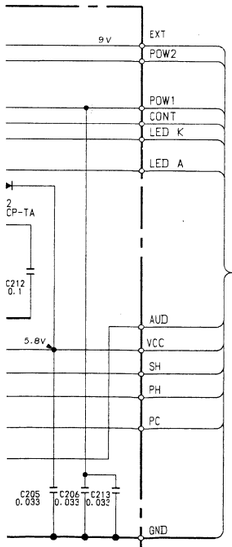
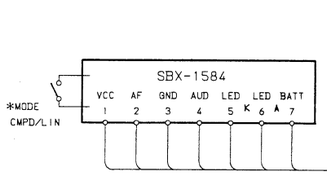


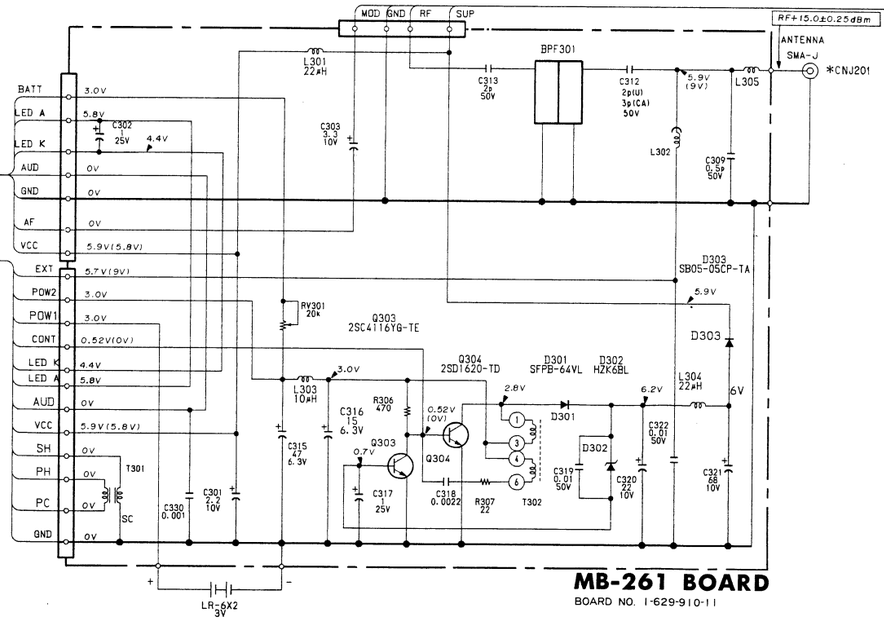
#	Ref.NO.	US	CANADA
	C122	43P (RH)	47P (RH)
	C126	75P (RH)	82P (RH)
	C134	15P (RH)	18P (RH)
	C135	18P (RH)	24P (RH)
	C147	2P (RH)	3P (RH)

RF-21 BOARD
BOARD NO. 1-629-912-11



29 BOARD
1-629-909-11





MB-261 BOARD
BOARD NO. 1-629-910-11

NOTES

- The MB-261, RF-21 and SW-329 boards must be replaced as each complete PCB. Only the parts marked * in the schematic are supplied as serviceable part. (For details, refer to the ELECTRICAL PARTS LIST.)
- The Voltages shown on each board are the values inputted without signal.
- The voltages have been measured in the following conditions.

RF-21 board : The RF-21 board must have been separated from the unit and installed to the RF board adjustment fixture (J-6223-150-A).
The value measured when DC+6V is supplied.

MB-261 board : The MB-261 board must have been installed in the unit.
The value measured when DC+3V is supplied to the battery spring terminal of the unit.
The values shown in parentheses when DC+9V is supplied through MIC connector.

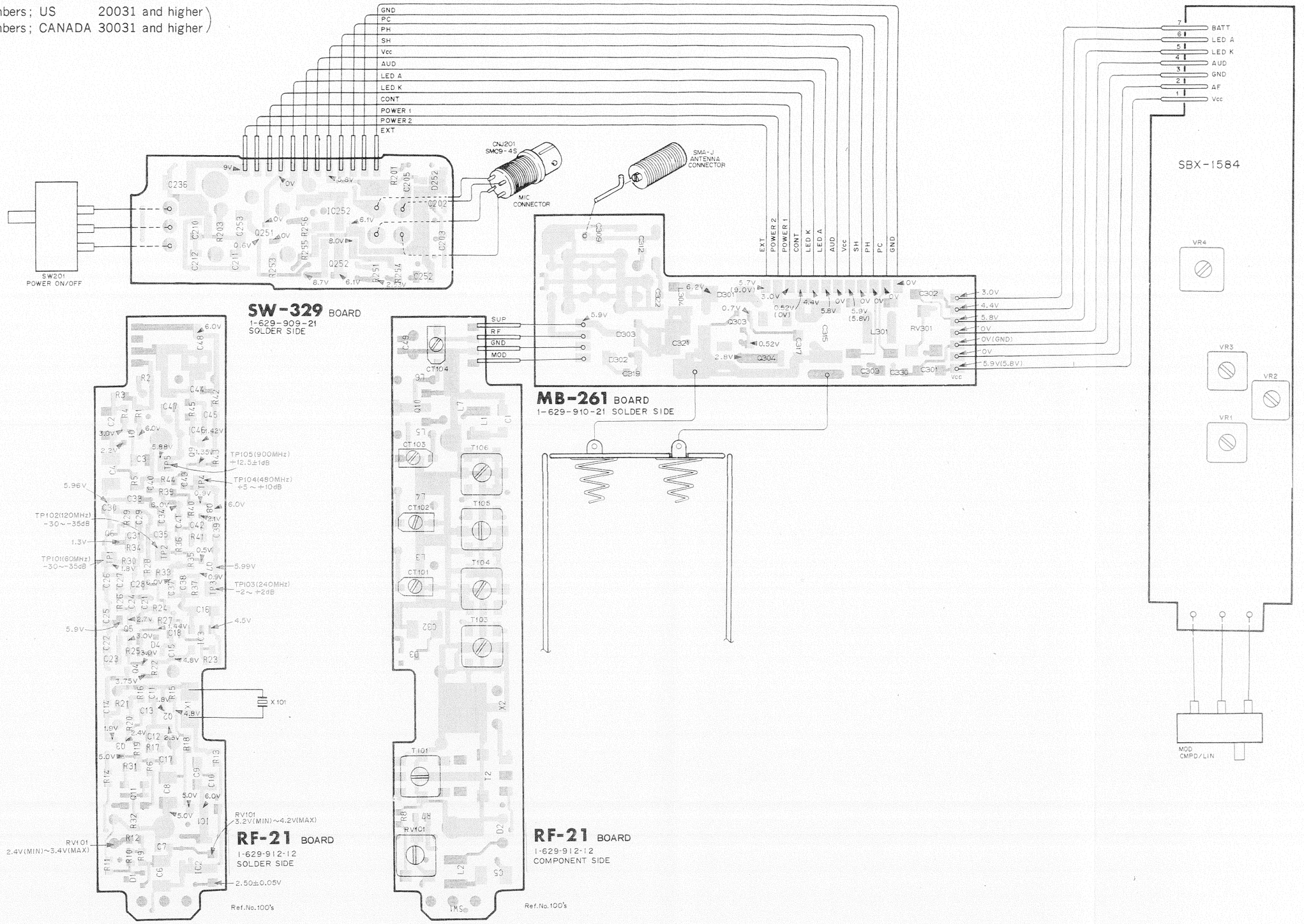
SW-329 board : The SW-329 board must have been separated from the unit.
The value measured when 82-ohm resistor is connected between V_{CC} and ground of SW-329 board and DC+9V is supplied to MIC connector.

- Voltages are measured with a Digital Multimeter. (Input impedance 10MΩ)

WRT-28H WRT-28H

4-4. CIRCUIT BOARD DIAGRAMS

(Serial Numbers; US 20031 and higher
Serial Numbers; CANADA 30031 and higher)



NOTES

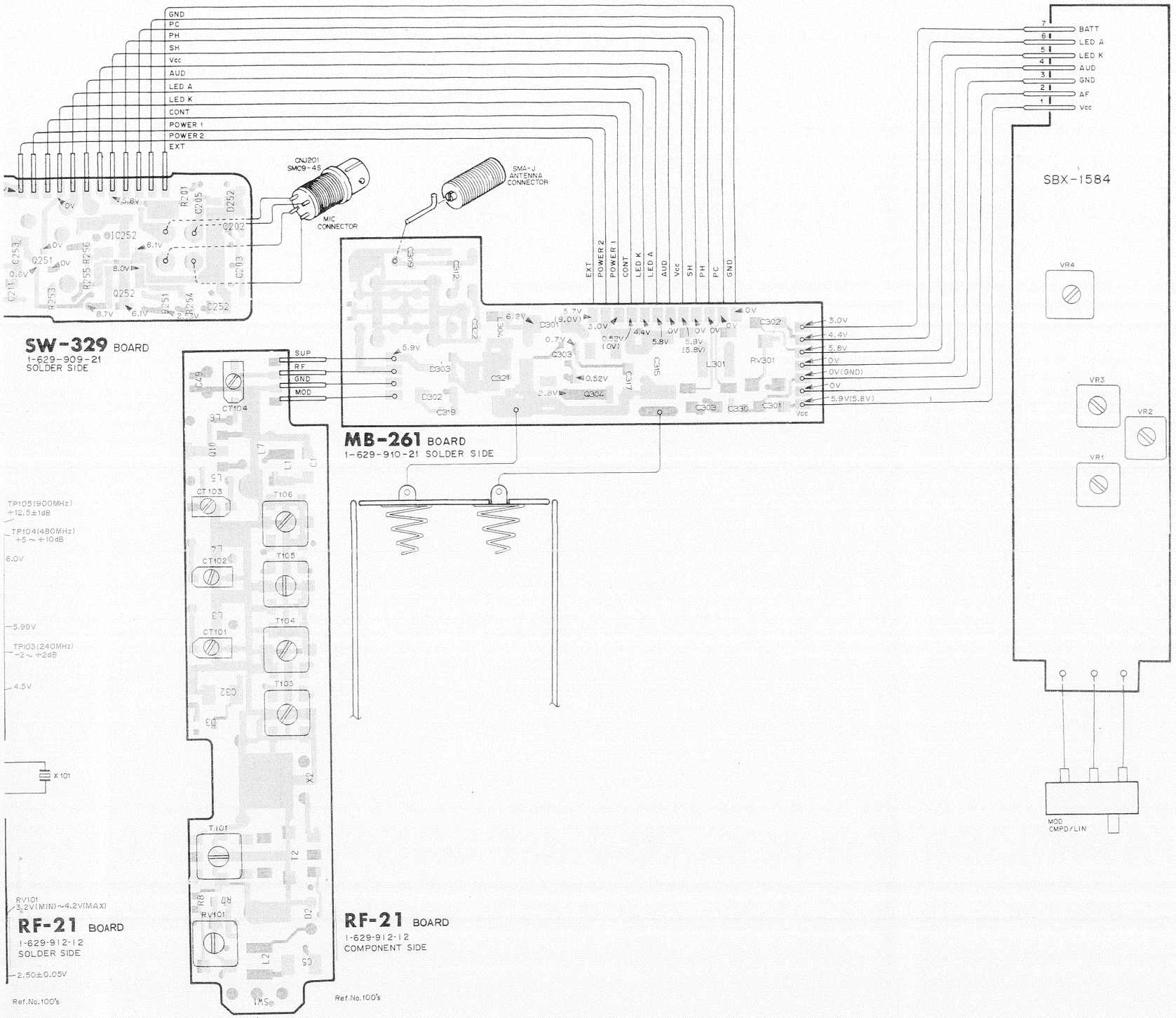
- The Voltages sho
  ted without signa
- The voltages hav
  tions.
  RF-21 board

MB-261 board

SW-329 board

- The actual RF-2
  four layers of tra
  necessary traces
  Nos. are not the

- Voltages are me
  (Input impedance



NOTES

- The Voltages shown on each board are the values inputted without signal.
- The voltages have been measured in the following conditions.

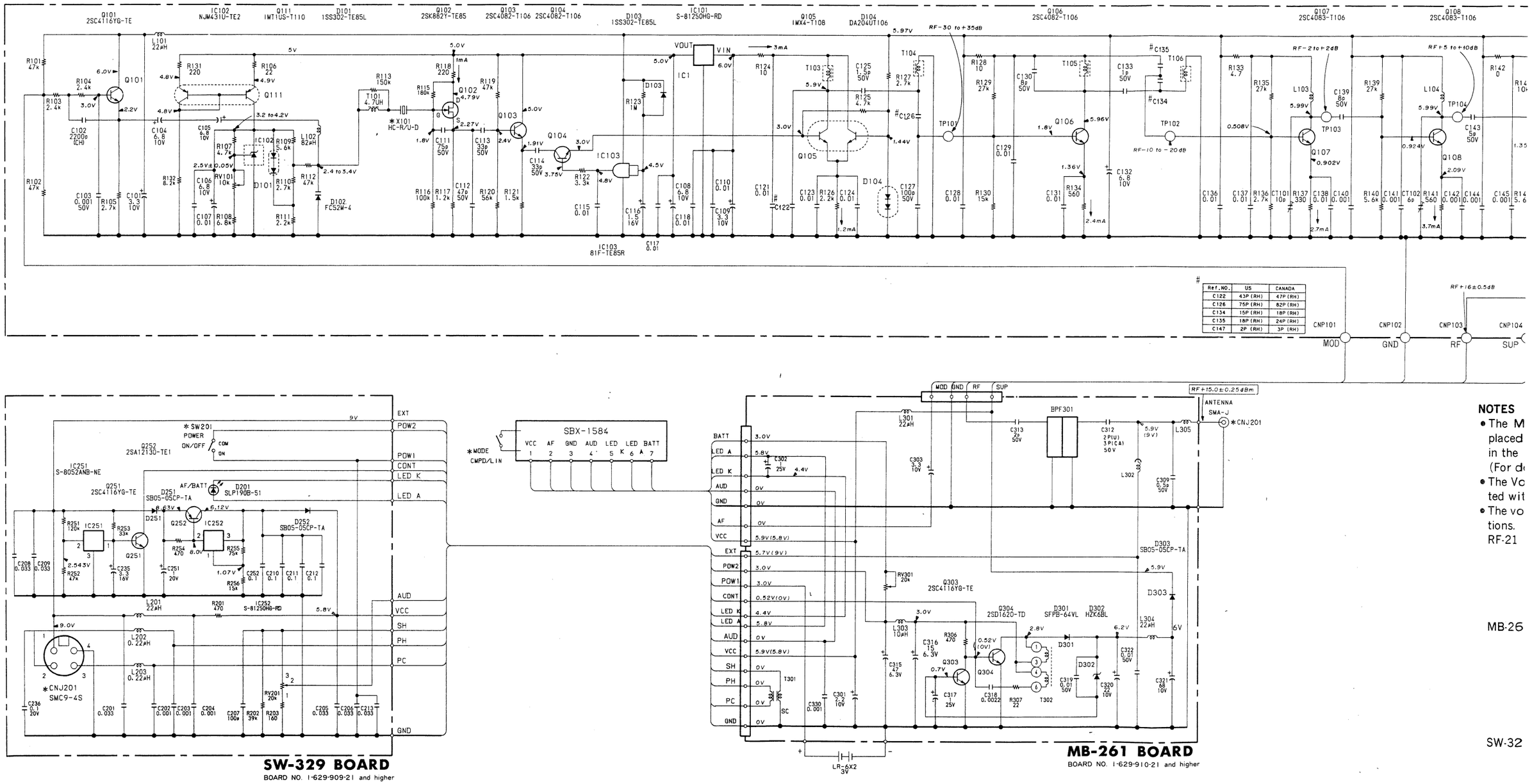
RF-21 board	: The RF-21 board must have been separated from the unit and installed to the RF board adjustment fixture (J-6223-150-A). The value measured when DC+6V is supplied.
MB-261 board	: The MB-261 board must have been installed in the unit. The value measured when DC+3V is supplied to the battery spring terminal of the unit. The values shown in parentheses when DC+9V is supplied through MIC connector.
SW-329 board	: The SW-329 board must have been separated from the unit. The value measured when 82-ohm resistor is connected between V_{CC} and ground of SW-329 board and DC+9V is supplied to MIC connector.

- The actual RF-21, MB-261 and SW-329 boards have four layers of traces, but in this service manual, only the necessary traces and Ref. Nos. are described. These Ref. Nos. are not the printed letters on the actual board.

- Voltages are measured with a Digital Multimeter. (Input impedance 10MΩ)

4-5. SCHEMATIC DIAGRAMS

(Serial Numbers; US 20031 and higher
Serial Numbers; CANADA 30031 and higher)



Ref.NO.	US	CANADA
C122	43P (RH)	47P (RH)
C126	75P (RH)	82P (RH)
C134	15P (RH)	18P (RH)
C135	18P (RH)	24P (RH)
C147	2P (RH)	3P (RH)

SW-329 BOARD
BOARD NO. 1-629-909-21 and higher

MB-261 BOARD
BOARD NO. 1-629-910-21 and higher

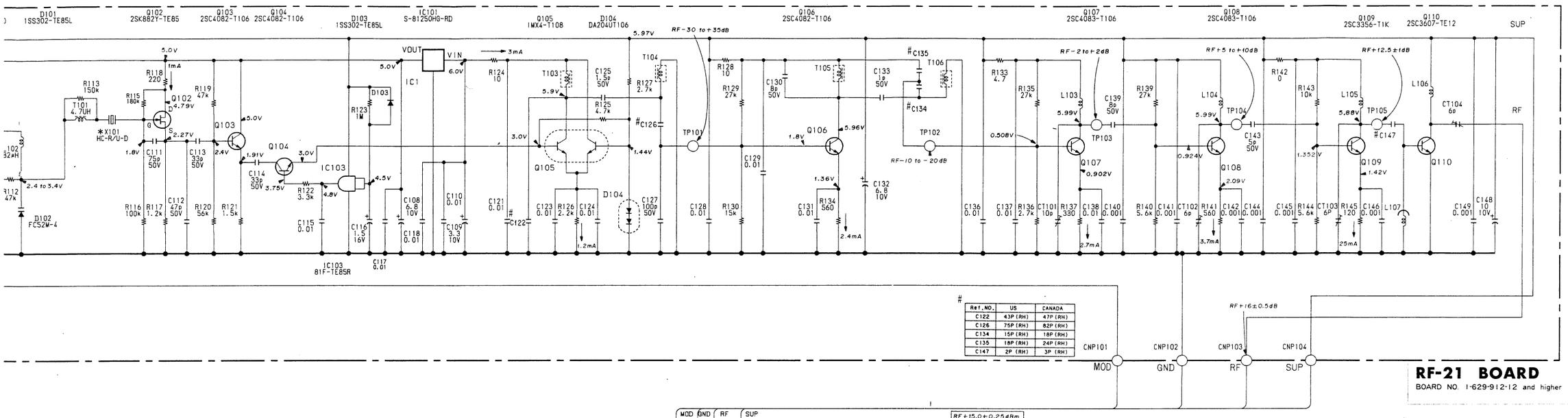
NOTES
- The M
placed
in the
(For d
- The Vo
ted wit
- The vo
tions.
RF-21

MB-26

SW-32

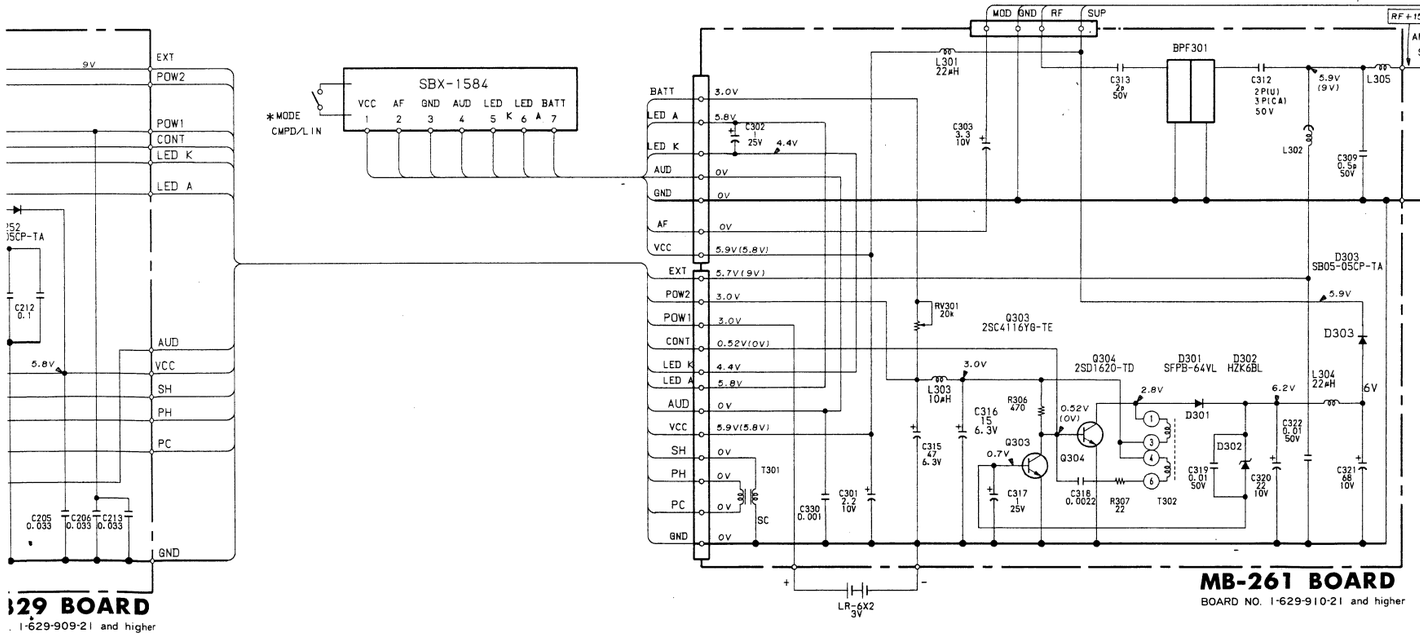
- Volta
(Input

s; US 20031 and higher)
s; CANADA 30031 and higher)



Ref.NO.	US	CANADA
C122	43P (RH)	47P (RH)
C126	75P (RH)	82P (RH)
C134	15P (RH)	18P (RH)
C135	18P (RH)	24P (RH)
C147	2P (RH)	3P (RH)

RF-21 BOARD
BOARD NO. 1-629-912-12 and higher



MB-261 BOARD
BOARD NO. 1-629-910-21 and higher

NOTES

- The MB-261, RF-21 and SW-329 boards must be replaced as each complete PCB. Only the parts marked * in the schematic are supplied as serviceable part. (For details, refer to the ELECTRICAL PARTS LIST.)
- The Voltages shown on each board are the values inputted without signal.
- The voltages have been measured in the following conditions.

RF-21 board : The RF-21 board must have been separated from the unit and installed to the RF board adjustment fixture (J-6223-150-A).
The value measured when DC+6V is supplied.

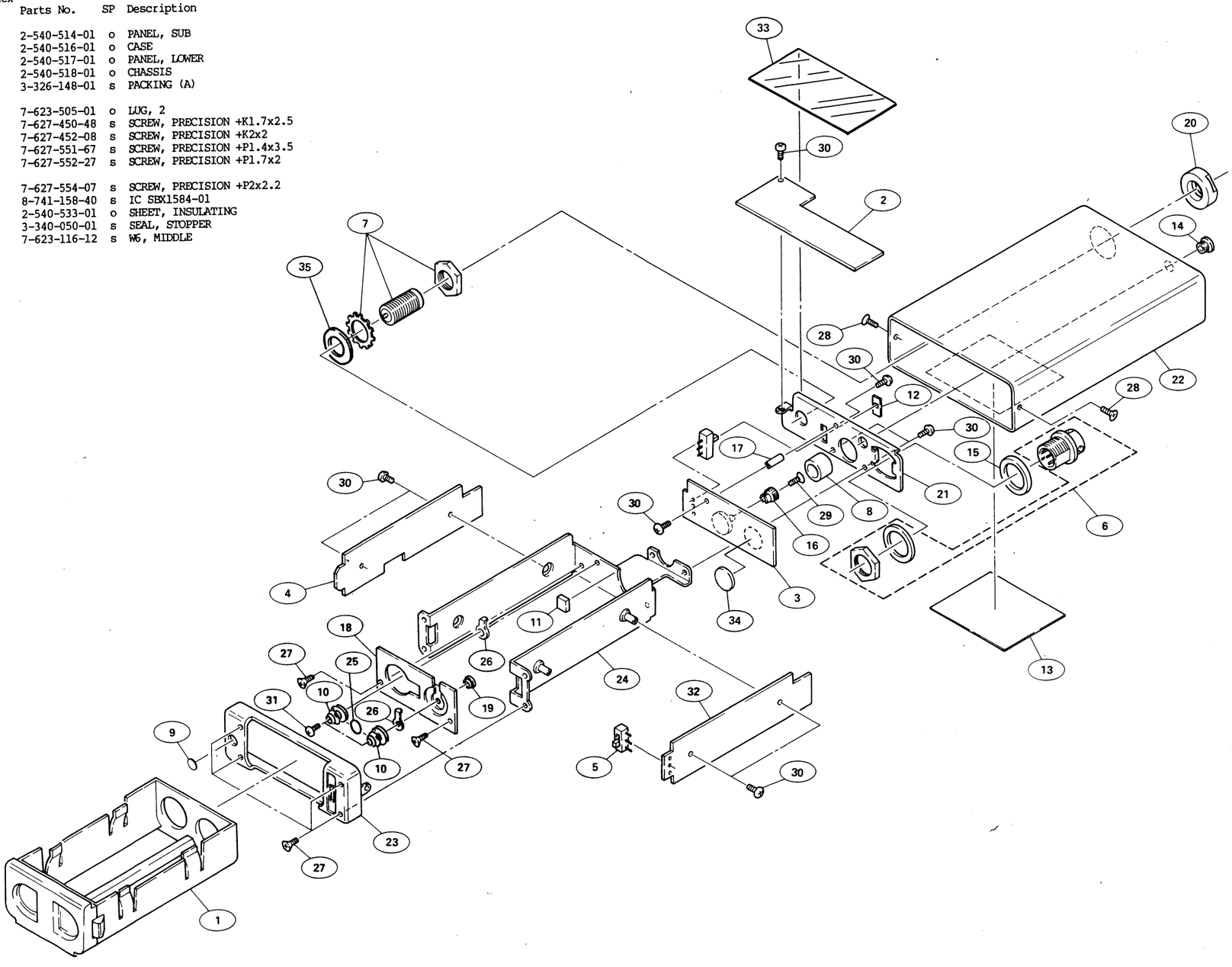
MB-261 board : The MB-261 board must have been installed in the unit.
The value measured when DC+3V is supplied to the battery spring terminal of the unit.
The values shown in parentheses when DC+9V is supplied through MIC connector.

SW-329 board : The SW-329 board must have been separated from the unit.
The value measured when 82-ohm resistor is connected between V_{CC} and ground of SW-329 board and DC+9V is supplied to MIC connector.

- Voltages are measured with a Digital Multimeter. (Input impedance 10MΩ)

5 PARTS

Index No.	Parts No.	SP	Description
21	2-540-514-01	o	PANEL, SUB
22	2-540-516-01	o	CASE
23	2-540-517-01	o	PANEL, LOWER
24	2-540-518-01	o	CHASSIS
25	3-326-148-01	s	PACKING (A)
26	7-623-505-01	o	LUG, 2
27	7-627-450-48	s	SCREW, PRECISION +K1.7x2.5
28	7-627-452-08	s	SCREW, PRECISION +K2x2
29	7-627-551-67	s	SCREW, PRECISION +P1.4x3.5
30	7-627-552-27	s	SCREW, PRECISION +P1.7x2
31	7-627-554-07	s	SCREW, PRECISION +P2x2.2
32	8-741-158-40	s	IC SEX1584-01
33	2-540-533-01	o	SHEET, INSULATING
34	3-340-050-01	s	SEAL, STOPPER
35	7-623-116-12	s	W6, MIDDLE



5-2. ELECTRICAL PARTS LIST

Ref No.	Parts No.	SP	Description
MB-261 BOARD			
-	A-4534-047-A	o	COMPLETE PCB, MB-261(For U)
-	A-4534-048-A	o	COMPLETE PCB, MB-261(For CA)
RF-21 BOARD			
-	A-4537-033-A	o	COMPLETE PCB, RF-21 (For U)
-	A-4537-034-A	o	COMPLETE PCB, RF-21 (For CA)
(Each assembly does not include the following parts.)			
X101	1-577-386-11	s	CRYSTAL 19749.4KHz (11CH,for U)
(*)	1-577-387-11	s	CRYSTAL 19770.1KHz (12CH,for U)
	1-577-388-11	s	CRYSTAL 19811.9KHz (13CH,for U)
	1-577-389-11	s	CRYSTAL 19843.1KHz (14CH,for U)
	1-577-390-11	s	CRYSTAL 19785.8KHz (15CH,for U)
	1-577-391-11	s	CRYSTAL 19759.8KHz (21CH,for U)
	1-577-392-11	s	CRYSTAL 19801.5KHz (22CH,for U)
	1-577-393-11	s	CRYSTAL 19822.3KHz (23CH,for U)
	1-577-394-11	s	CRYSTAL 19832.7KHz (24CH,for U)
	1-577-395-11	s	CRYSTAL 19775.4KHz (25CH,for U)
	1-577-396-11	s	CRYSTAL 19791.0KHz (31CH,for U)
	1-577-397-11	s	CRYSTAL 19780.6KHz (32CH,for U)
	1-577-398-11	s	CRYSTAL 19806.7KHz (33CH,for U)
	1-577-399-11	s	CRYSTAL 19837.9KHz (34CH,for U)
	1-577-400-11	s	CRYSTAL 18822.3KHz (11CH,for CA)
	1-577-401-11	s	CRYSTAL 18848.3KHz (12CH,for CA)
	1-577-402-11	s	CRYSTAL 18869.2KHz (13CH,for CA)
	1-577-403-11	s	CRYSTAL 18936.9KHz (14CH,for CA)
	1-577-404-11	s	CRYSTAL 18952.5KHz (15CH,for CA)
	1-577-405-11	s	CRYSTAL 18994.2KHz (16CH,for CA)
	1-577-406-11	s	CRYSTAL 19030.6KHz (17CH,for CA)
	1-577-407-11	s	CRYSTAL 19093.1KHz (18CH,for CA)
	1-577-408-11	s	CRYSTAL 18942.1KHz (21CH,for CA)
	1-577-409-11	s	CRYSTAL 18968.1KHz (22CH,for CA)
	1-577-410-11	s	CRYSTAL 18989.0KHz (23CH,for CA)
	1-577-411-11	s	CRYSTAL 19056.7KHz (24CH,for CA)
	1-577-412-11	s	CRYSTAL 19072.3KHz (25CH,for CA)
	1-577-413-11	s	CRYSTAL 19114.0KHz (26CH,for CA)
	1-577-414-11	s	CRYSTAL 19150.4KHz (27CH,for CA)
	1-577-415-11	s	CRYSTAL 19212.9KHz (28CH,for CA)
	1-577-416-11	s	CRYSTAL 19061.9KHz (31CH,for CA)
	1-577-417-11	s	CRYSTAL 19124.4KHz (32CH,for CA)
	1-577-418-11	s	CRYSTAL 19160.8KHz (33CH,for CA)
	1-577-419-11	s	CRYSTAL 19202.5KHz (34CH,for CA)
	1-577-420-11	s	CRYSTAL 19218.1KHz (35CH,for CA)
	1-577-421-11	s	CRYSTAL 19285.8KHz (36CH,for CA)
	1-577-422-11	s	CRYSTAL 19306.7KHz (37CH,for CA)
	1-577-423-11	s	CRYSTAL 19332.7KHz (38CH,for CA)

Note
* : These crystals are the choice parts.
The WRT-28H has a certain one selected from the above crystals.

SECTION 5
REPLACEBLE PARTS

PARTS ORDERING INFORMATION

Standardization of Parts
Repair parts supplied from Sony Parts Center may not be always identical with the part which actually in use due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
This manual's exploded views and electrical parts list are indicating the parts numbers of the "standardized genuine parts at present".

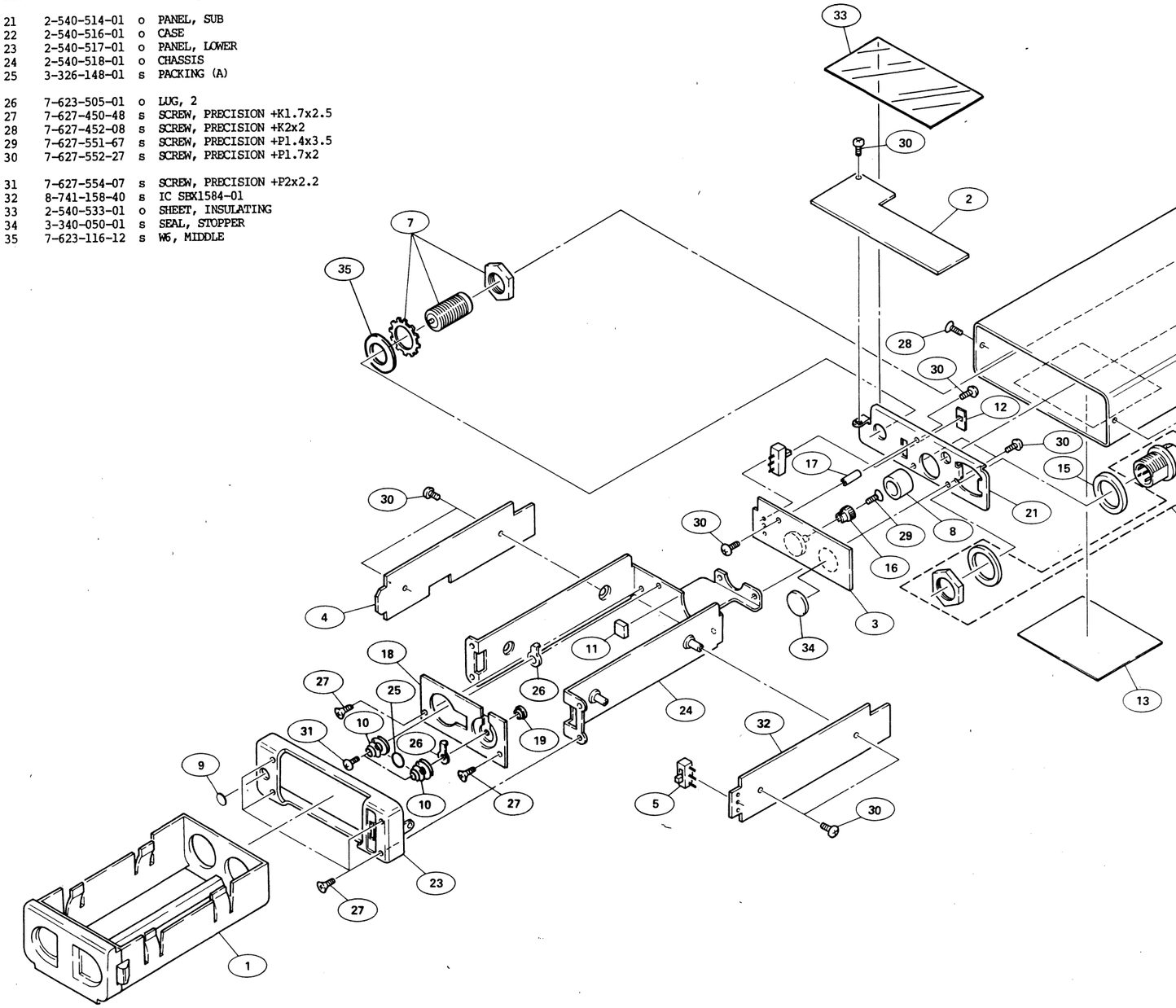
Parts marked with S in the column of SP
These parts are normally stocked as replaceable parts.

Parts marked with O in the column of SP
Orders for these parts will be processed, but allow for additional delivery time.

Parts without Part No.
These parts are not stocked because they are seldom required for routine service.

5-1. EXPLODED VIEW AND PARTS LIST

Index No.	Parts No.	SP	Description
WRT-28H			
1	A-4521-033-A	s	CASE ASSY, BATTERY
2	A-4534-047-A	o	COMPLETE PCB, MB-261 (For U)
	A-4534-048-A	o	COMPLETE PCB, MB-261 (For CA)
3	A-4534-051-A	o	COMPLETE PCB, SW-329
4	A-4537-033-A	o	COMPLETE PCB, RF-21 (For U)
	A-4537-034-A	o	COMPLETE PCB, RF-21 (For CA)
5	1-553-510-00	s	SWITCH, SLIDE
6	1-561-309-00	s	CONNECTOR, MIC
7	1-561-565-00	s	CONNECTOR, ANT
8	2-527-010-02	s	KNOB, ATTENUATOR
9	2-527-076-11	o	EMBLEM,CHANNEL(11CH)
	2-527-076-12	o	EMBLEM,CHANNEL(12CH)
	2-527-076-13	o	EMBLEM,CHANNEL(13CH)
	2-527-076-14	o	EMBLEM,CHANNEL(14CH)
	2-527-076-15	o	EMBLEM,CHANNEL(15CH)
	2-527-076-16	o	EMBLEM,CHANNEL(16CH,for CA only)
	2-527-076-17	o	EMBLEM,CHANNEL(17CH,for CA only)
	2-527-076-18	o	EMBLEM,CHANNEL(18CH,for CA only)
	2-527-076-21	o	EMBLEM,CHANNEL(21CH)
	2-527-076-22	o	EMBLEM,CHANNEL(22CH)
	2-527-076-23	o	EMBLEM,CHANNEL(23CH)
	2-527-076-24	o	EMBLEM,CHANNEL(24CH)
	2-527-076-25	o	EMBLEM,CHANNEL(25CH)
	2-527-076-26	o	EMBLEM,CHANNEL(26CH,for CA only)
	2-527-076-27	o	EMBLEM,CHANNEL(27CH,for CA only)
	2-527-076-28	o	EMBLEM,CHANNEL(28CH,for CA only)
	2-527-076-31	o	EMBLEM,CHANNEL(31CH)
	2-527-076-32	o	EMBLEM,CHANNEL(32CH)
	2-527-076-33	o	EMBLEM,CHANNEL(33CH)
	2-527-076-34	o	EMBLEM,CHANNEL(34CH)
	2-527-076-35	o	EMBLEM,CHANNEL(35CH)
	2-527-076-36	o	EMBLEM,CHANNEL(36CH,for CA only)
	2-527-076-37	o	EMBLEM,CHANNEL(37CH,for CA only)
	2-527-076-38	o	EMBLEM,CHANNEL(38CH,for CA only)
10	2-536-617-01	s	SPRING
11	2-536-671-01	s	CUSION
12	2-540-004-01	o	SPACER, SW
13	2-540-501-01	o	LABEL, MODEL NUMBER
14	2-540-505-01	s	ESCUTCHEON, LED
15	2-540-506-01	o	SPACER, CONNECTOR
16	2-540-507-01	o	SHAFT, ROTARY
17	2-540-508-01	o	STAY, PC BOARD
18	2-540-509-01	o	TERMINAL BOARD, PLUS
19	2-540-510-01	o	STAY, TERMINAL
20	2-540-512-01	s	RING, ORNAMENTAL
21	2-540-514-01	o	PANEL, SUB
22	2-540-516-01	o	CASE
23	2-540-517-01	o	PANEL, LOWER
24	2-540-518-01	o	CHASSIS
25	3-326-148-01	s	PACKING (A)
26	7-623-505-01	o	LUG, 2
27	7-627-450-48	s	SCREW, PRECISION +K1.7x2.5
28	7-627-452-08	s	SCREW, PRECISION +K2x2
29	7-627-551-67	s	SCREW, PRECISION +P1.4x3.5
30	7-627-552-27	s	SCREW, PRECISION +P1.7x2
31	7-627-554-07	s	SCREW, PRECISION +P2x2.2
32	8-741-158-40	s	IC SBX1584-01
33	2-540-533-01	o	SHEET, INSULATING
34	3-340-050-01	s	SEAL, STOPPER
35	7-623-116-12	s	W6, MIDDLE



5-2. ELECTR

Ref No.	Parts No.
MB-261 BOARD	
-	A-4534-047-A
-	A-4534-048-A
RF-21 BOARD	
-	A-4537-033-A
-	A-4537-034-A
(Each assembly doe	
X101	1-577-386-11
(*)	1-577-387-11
	1-577-388-11
	1-577-389-11
	1-577-390-11
	1-577-391-11
	1-577-392-11
	1-577-393-11
	1-577-394-11
	1-577-395-11
	1-577-396-11
	1-577-397-11
	1-577-398-11
	1-577-399-11
	1-577-400-11
	1-577-401-11
	1-577-402-11
	1-577-403-11
	1-577-404-11
	1-577-405-11
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	1-577-412-11
	1-577-413-11
	1-577-414-11
	1-577-415-11
	1-577-416-11
	1-577-417-11
	1-577-418-11
	1-577-419-11
	1-577-420-11
	1-577-421-11
	1-577-422-11
	1-577-423-11

Note
* : These cryst
The WRT-28
from the a

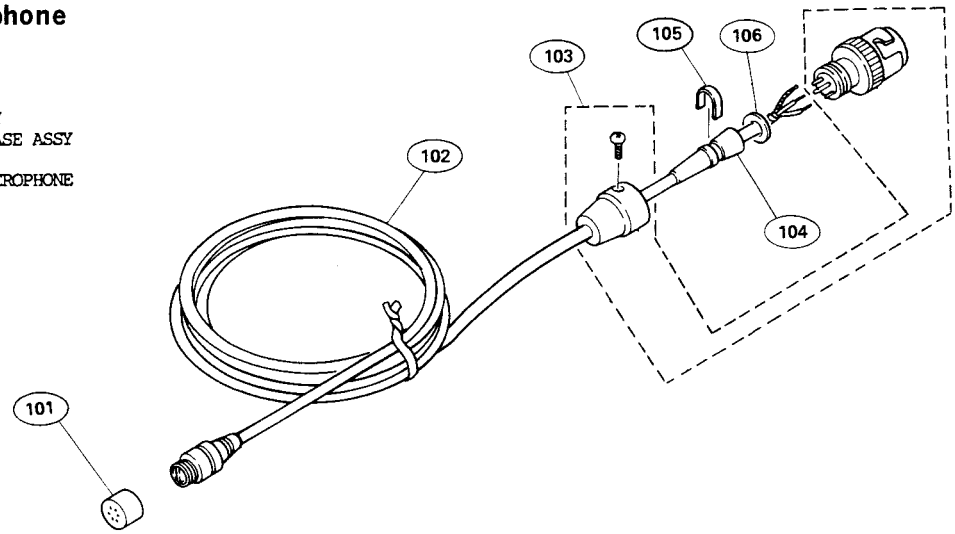
Ref No.	Parts No.	SP	Description
SW-329 BOARD			
-	A-4534-051-A	o	COMPLETE PCB, SW-329
(This assembly includes the following perts)			
SW201	1-571-624-21	s	SWITCH, SLIDE
FRAME			
-	1-553-510-00	s	SWITCH, SLIDE
CNJ201	1-561-309-00	s	CONNECTOR, MIC
CNJ202	1-561-565-00	s	CONNECTOR, ANT
-	8-741-158-40	s	IC SEX1584-01

SECTION 6
ACCESSORIES SUPPLIED

6-1. EXPLODED VIEWS AND PARTS LIST

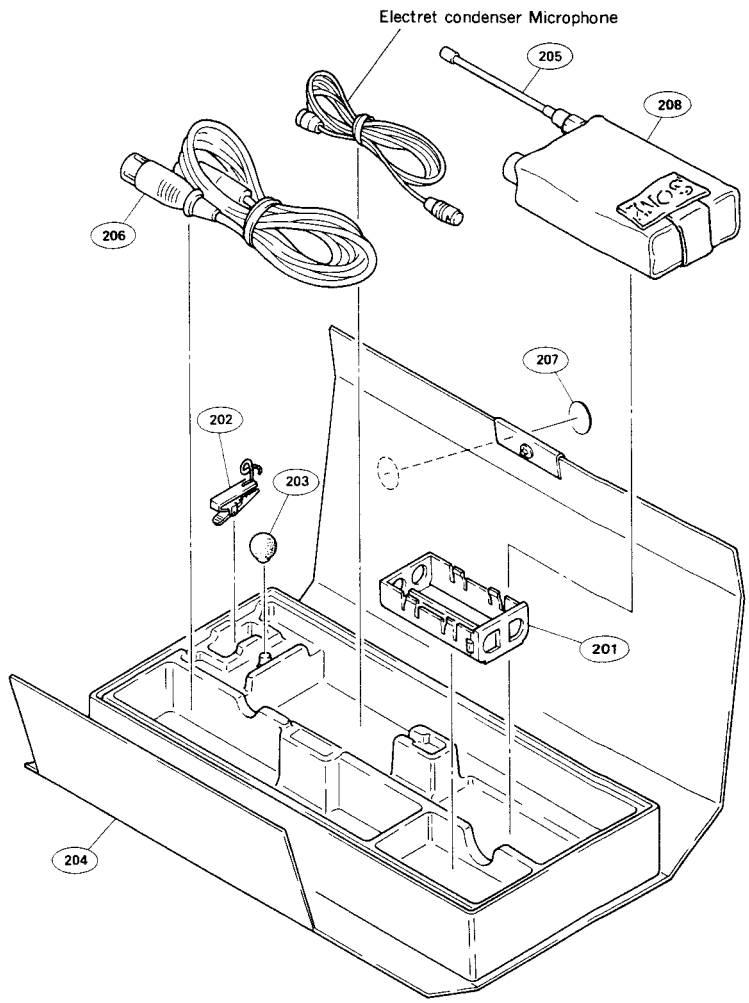
Electret Condenser Microphone

Index No.	Parts No.	SP	Description
101	A-4510-050-A	s	CAPSULE ASSY
102	X-2537-418-1	s	AMPLIFIER CASE ASSY
103	1-560-155-41	s	CONNECTOR
104	2-523-605-00	s	BUSHING, MICROPHONE
105	2-523-606-00	s	CLAMP, CORD
106	3-701-437-21	s	WASHER



Other Accessories

INDEX NO.	Parts No.	SP	Description
201	A-4521-033-A	s	CASE ASSY, BATTERY
202	X-2537-404-1	s	CLIP ASSY, HORIZONTAL HOLDER
203	X-2537-410-1	s	SCREW, WINDOW
204	X-2540-501-1	o	CASE ASSY, CARRYING
205	1-501-438-11	s	ANTENNA
206	1-551-710-00	o	CABLE, MIC
207	2-527-514-11	o	SEAL, CHANNEL (11CH)
	2-527-514-12	o	SEAL, CHANNEL (12CH)
	2-527-514-13	o	SEAL, CHANNEL (13CH)
	2-527-514-14	o	SEAL, CHANNEL (14CH)
	2-527-514-15	o	SEAL, CHANNEL (15CH)
	2-527-514-16	o	SEAL, CHANNEL (16CH,for CA)
	2-527-514-17	o	SEAL, CHANNEL (17CH,for CA)
	2-527-514-18	o	SEAL, CHANNEL (18CH,for CA)
	2-527-514-21	o	SEAL, CHANNEL (21CH)
	2-527-514-22	o	SEAL, CHANNEL (22CH)
	2-527-514-23	o	SEAL, CHANNEL (23CH)
	2-527-514-24	o	SEAL, CHANNEL (24CH)
	2-527-514-25	o	SEAL, CHANNEL (25CH)
	2-527-514-26	o	SEAL, CHANNEL (26CH,for CA)
	2-527-514-27	o	SEAL, CHANNEL (27CH,for CA)
	2-527-514-28	o	SEAL, CHANNEL (28CH,for CA)
	2-527-514-31	o	SEAL, CHANNEL (31CH)
	2-527-514-32	o	SEAL, CHANNEL (32CH)
	2-527-514-33	o	SEAL, CHANNEL (33CH)
	2-527-514-34	o	SEAL, CHANNEL (34CH)
	2-527-514-35	o	SEAL, CHANNEL (35CH,for CA)
	2-527-514-36	o	SEAL, CHANNEL (36CH,for CA)
	2-527-514-37	o	SEAL, CHANNEL (37CH,for CA)
	2-527-514-38	o	SEAL, CHANNEL (38CH,for CA)
208	2-540-523-01	s	CASE, SOFT
	3-750-392-21	s	MANUAL, INSTRUCTION



WRT-28H(U,CA)
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